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PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEABED AUTHORITY
AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA

REPORT OF THE PREPARATORY COMMISSION, UNDER PARAGRAPH 11 OF RESOLUTION I OF THE THIRD UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA, ON ALL MATTERS WITHIN ITS MANDATE, EXCEPT AS PROVIDED IN PARAGRAPH 10, FOR PRESENTATION TO THE ASSEMBLY OF THE INTERNATIONAL SEABED AUTHORITY AT ITS FIRST SESSION

VOLUME XI

Part One

Working papers of Special Commission 2

Part Two

Conference room papers of Special Commission 2

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CONTENTS

Page

Part One

Working papers of Special Commission 2

LOS/PCN/SCN.2/WP.1 Special Commission for the Enterprise. Mandate and programme of work Background paper by the Secretariat 8

LOS/PCN/SCN.2/WP.1/Add.1 Special Commission for the Enterprise. Mandate and programme of work. Addendum Background paper by the Secretariat List of provisions of the United Nations Convention on the Law of the Sea dealing with organizational and operational aspects of the Enterprise 22

LOS/PCN/SCN.2/WP.2 The Enterprise Start-up requirements and preparatory measures. Background paper by the Secretariat 27

LOS/PCN/SCN.2/WP.3 Information note on elements of joint ventures Background paper by the Secretariat 67

LOS/PCN/SCN.2/WP.4 Proposal on joint venture Proposals by the delegations of Belgium, France, the Federal Republic of Germany, Italy, Japan, the Netherlands and the United Kingdom of Great Britain and Northern Ireland 77

LOS/PCN/SCN.2/WP.5 A model joint venture agreement for seabed mining Submitted by the delegation of the Federal Republic of Germany 82

LOS/PCN/SCN.2/WP.5/Corr.1 (Russian only) Corrigendum

LOS/PCN/SCN.2/WP.5/Corr.2 (English only) Corrigendum 128

LOS/PCN/SCN.2/WP.6 Project profile of a deep seabed mining operation by the Enterprise Working paper prepared by the Secretariat 129

LOS/PCN/SCN.2/WP.6/Add.1 Project profile of a deep seabed mining operation by the Enterprise. Addendum Working paper by the Secretariat 189

/...

CONTENTS (continued)

		Page
LOS/PCN/SCN.2/WP.6/Add.1/ Corr.1	Corrigendum	201
LOS/PCN/SCN.2/WP.7	Development of an ad hoc expert core group for the Enterprise to assist the Preparatory Commission Working paper prepared by the Secretariat	202
LOS/PCN/SCN.2/WP.8	Training needs and requirements of the Enterprise Working paper prepared by the Secretariat	214
LOS/PCN/SCN.2/WP.9	Implementation of paragraph 12 of resolution II: Training Working paper by the Secretariat	219
LOS/PCN/SCN.2/WP.9/Add.1	Implementation of paragraph 12 of resolution II: Training. Addendum Additional responses of delegations to inquiries made by the Secretariat Working paper prepared by the Secretariat	248
LOS/PCN/SCN.2/WP.10	The Enterprise Economic viability of deep seabed mining of polymetallic nodules Submitted by the delegation of Australia	253
LOS/PCN/SCN.2/WP.10/Add.1 (English only)	The Enterprise Economic viability of deep seabed mining of polymetallic nodules. Addendum Submitted by the delegation of Australia	311
LOS/PCN/SCN.2/WP.11	Main elements of a training programme Working paper by the Secretariat	359
LOS/PCN/SCN.2/WP.12	A nucleus Enterprise Note by the Secretariat	365
LOS/PCN/SCN.2/WP.13	Questions relating to training of personnel for the Enterprise in accordance with the United Nations Convention on the Law of the Sea Working paper prepared by a working group of the Contact Group of the Group of 77 on the Enterprise (Bangladesh, Brazil, Cameroon, Jamaica, Kenya, Pakistan, Thailand and Tunisia)	368
LOS/PCN/SCN.2/WP.14	The International Venture Study submitted by the Republic of Colombia	373

/...

CONTENTS (continued)

		Page
LOS/PCN/SCN.2/WP.14/Add.1	The International Venture Study submitted by the Republic of Colombia Addendum	386
LOS/PCN/SCN.2/WP.14/Add.2	The International Venture Study submitted by the Republic of Colombia Addendum	415
LOS/PCN/SCN.2/WP.15	Structure and organization of the Enterprise Working paper by the Secretariat	422
LOS/PCN/SCN.2/WP.16	Provisions of the Convention relating to the structure and organization of the Enterprise Working paper by the Secretariat	438
LOS/PCN/SCN.2/WP.17	Exploration for deep sea polymetallic nodules Working paper by the Secretariat	462
LOS/PCN/SCN.2/WP.18	Draft basic joint venture contract Working paper by the Secretariat	478
LOS/PCN/SCN.2/WP.18/Add.1	Draft basic joint venture contract Addendum Working paper by the Secretariat	494
LOS/PCN/SCN.2/WP.18/Rev.1	Draft basic joint venture contract with recommended annotations by Special Commission 2 Working paper by the Secretariat	503
LOS/PCN/SCN.2/WP.18/Rev.2	The joint venture option for the Enterprise - Draft basic joint venture contract with annotations made in Special Commission 2 Working paper by the Secretariat	526

Part Two

Conference room papers of Special Commission 2

LOS/PCN/SCN.2/1984/CRP.1	Programme of work. Special Commission 2	552
LOS/PCN/SCN.2/1984/CRP.2	Contractual rules that may be applicable to the implementation of paragraph 12 (a) (i) of resolution II on exploration Note by the Secretariat	553
LOS/PCN/SCN.2/1988/CRP.3	Draft principles and policies for a Preparatory Commission training programme	562

/...

CONTENTS (continued)

		Page
LOS/PCN/SCN.2/1989/CRP.4	Draft guidelines and procedures for the implementation of the training programme	564
LOS/PCN/SCN.2/1990/CRP.5	Suggestions of the Chairman to facilitate discussion of transitional arrangements for the Enterprise	568
LOS/PCN/SCN.2/1991/CRP.5/ Add.1	Suggestions of the Chairman to facilitate discussion of transitional arrangements for the Enterprise. Addendum	572
LOS/PCN/SCN.2/1991/CRP.5/ Add.2	Suggestions of the Chairman to facilitate discussion of transitional arrangements for the Enterprise. Addendum	573
LOS/PCN/SCN.2/1992/CRP.5/ Rev.1	Recommended annotations by Special Commission 2 on the suggestions of the Chairman of the Special Commission to facilitate discussions on transitional arrangements for the Enterprise ...	574
LOS/PCN/SCN.2/1992/CRP.5/ Rev.2	The initial operations and administration of the Enterprise. Annotations made in Special Commission 2 on the suggestions of the Chairman of the Special Commission to facilitate discussions on transitional arrangements for the Enterprise	584
LOS/PCN/SCN.2/1992/CRP.6	Draft provisional final report of Special Commission 2	595

PART ONE

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LOS/PCN/SCN.2/WP.1
27 February 1984

ORIGINAL: ENGLISH

Preparatory Commission for the International
Sea-Bed Authority and for the International
Tribunal for the Law of the Sea
Special Commission 2

SPECIAL COMMISSION FOR THE ENTERPRISE MANDATE AND PROGRAMME OF WORK

Background paper by the Secretariat

Introduction

1. The Special Commission for the Enterprise, established by resolution I, paragraph 8, is entrusted with functions, the basic purpose of which is outlined in the final preambular paragraph of resolution II. The responsibilities of the Special Commission, therefore, not only concern the "early entry into effective operation of the Enterprise", but relate also to the successful implementation of the scheme for pioneer investors.

2. The preparatory work of the Special Commission must encompass both the organizational and operational requirements of the Enterprise. Organizational aspects may be regarded as commanding a first consideration inasmuch as the Enterprise will have to be set up before it can proceed to make operational decisions. However, the one facet of the work of the Special Commission could not be scheduled as following only on the other as the nature of the Enterprise's operations will, in some measure, dictate its organizational requirements, and certain aspects, including in particular the capacity of the Enterprise to employ different approaches to its operations, could introduce substantial variations over time in its managerial, administrative and financial requirements and rate of development. It may thus be more prudent to treat many organizational and operational features as closely interrelated matters until such time as the basic organizational requirements of the Enterprise can emerge, and to consider for this purpose working through a series of increasingly more elaborate feasibility studies towards the conclusions required for the final recommendations which the Special Commission must make on the organization and operations of the Enterprise, particularly its first operation.

3. Organizational and operational matters are discussed below following an elaboration of the mandate of the Special Commission. This paper also offers some comments on the sequence of work and on the general information and study requirements of the Special Commission.

Scope of the mandate and considerations in organizing the work of the Special Commission

4. According to paragraph 8 of resolution I, the Special Commission for the Enterprise shall:

(a) Take all measures necessary for the early entry into effective operation of the Enterprise; and

(b) Perform the functions referred to in paragraph 12 of resolution II.

5. Resolution II clearly contemplates that one of the main purposes of the scheme for pioneer investors is to ensure that on the coming into force of the Convention the Enterprise "will be provided with the funds, technology and expertise necessary to enable it to keep pace with the States and other entities". (See the preamble to resolution II.)

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6. The stated objective of paragraph 12 of resolution II is "to ensure that the Enterprise is able to carry out activities in the Area in such a manner as to keep pace with States and other entities". The paragraph does not actually refer to functions but to the undertakings of registered pioneer investors and certifying States. Thus, the mandate given in paragraph 8 of resolution I by reference to paragraph 12 of resolution II should be interpreted to mean that it is for the Special Commission for the Enterprise to deal with the questions relating to these undertakings in accordance with paragraph 12, the nature and purpose of which may be regarded as corresponding to "measures necessary for the early entry into effective operation of the Enterprise". Consequently, it would be for the Special Commission to make the arrangements for exploration and training referred to in that provision.

7. Further, with respect to the functions of the Special Commission as derived from paragraph 12 of resolution II, reference should be made to the statute of the Enterprise, annex IV of the Convention, article 11, paragraph 3 (a) and (c), wherein the funds referred to in resolution II, paragraph 12 (b)(i) are described and the Preparatory Commission 1/ is called upon to:

(a) Include the amount of the required initial fund and the criteria and factors for its adjustment in the draft rules, regulations and procedures of the Authority;

(b) Make recommendations for dealing with any short-fall in the contributions of States Parties to the Enterprise at the first session of the Assembly.

The cost implications, on the basis of which the Preparatory Commission will make its recommendations on the contributions of States Parties, will be a major topic for study by the Special Commission.

8. It may be further noted, in connection with paragraph 12 (a) (iii) of resolution II that, should the Enterprise be unsuccessful in obtaining the required technology "to commence in a timely manner the recovery and processing of minerals", article 5, paragraph 5 of annex III provides for the convening of a meeting of States Parties engaged in activities in the Area, sponsoring States and other States Parties having access to the required technology to ensure that such technology is made available to the Enterprise. It would seem possible, at least in the later stages of the work of the Special Commission, to anticipate and prepare for such a situation, particularly in connection with its recommendations for the first operations of the Enterprise and the amount of the initial fund.

9. Resolution II establishes certain other conditions which are relevant also to the work of the Special Commission. Paragraph 9 (a) establishes that the Enterprise shall be entitled to production authorizations for two mine sites, including the initial production reserved to the Enterprise under article 151, paragraph 5, of the Convention.

10. While the specific mandate of the Special Commission derives from resolution I, paragraph 8, resolution II, paragraph 12 and, to a certain extent also, from annex IV, article 11, paragraph 3, account should be taken of this mandate within the overall mandate of the Preparatory Commission as set out in paragraph 5 of resolution I. Certain of the measures required for the Enterprise relate to the budget of the Authority, to personnel matters and to arrangements at the seat of the Authority, as well as to the draft rules, regulations and procedures of the Authority on financial and administrative matters which must take account of the requirement of "financial independence" for the Enterprise, provided for in annex IV, article 11, paragraph 3 (f).

11. Moreover, there are issues affecting the operations of the Enterprise which fall within the mandate of the plenary and other Special Commissions. The Special Commission on the Enterprise will need to keep itself informed of developments and proposals on these issues and, where appropriate, may wish to agree on a modus operandi to ensure that it is kept informed and is able to advise other bodies of the Preparatory Commission. Examples of such issues are:

(a) (i) Aspects of rules, regulations and procedures concerning the financial terms of contracts which are "to enable the Enterprise to engage in seabed mining effectively at the same time as the entities referred to in article 153, paragraph 2(b)". (Annex III, article 13, para. 1 (e))

(ii) Establishment of incentives to enter into joint arrangements with the Enterprise. (Annex III, article 13, para. 1 (d) and (f))

(b) (i) Prescription of "substantive and procedural requirements and conditions" for joint ventures of the Enterprise. (Annex III, article 9, para. 3)

(ii) Terms of contracts which provide for joint arrangements. (Article 153, para. 3; and annex III, article 11)

(c) Prescription of "substantive and procedural requirements and conditions" for contracts for the execution of part of the activities of the Enterprise. (Annex III, article 9, paras. 2 and 3 and annex IV, article 12, para. 3)

12. The necessary measures referred to in resolution I, to be taken by the Special Commission, will cover various types of subject-matter (e.g. legal, technical, financial and administrative); different types of actions (e.g. preparation of draft rules and regulations, recommendations, feasibility studies, decisions under paragraph 12 (a) of resolution II involving the registered pioneer investors); and supporting activities in the collection of information and the preparation of reports and studies. Thus, different methods of work may be contemplated to take account of the diverse nature of the responsibilities of the Special Commission and of the need also for co-ordination with the plenary and other Special Commissions.

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13. It would be difficult to separate the various subjects involved in the work of the Special Commission and treat them with any degree of independence, since most aspects are interrelated. Questions of operational modalities and investment planning, availability of technology, costs and financing, and the development of managerial and operational skills, for example, are clearly interlocking matters. Furthermore, preparations undertaken within the framework of paragraph 12 of resolution II would entail decisions carrying an element of commitment to future courses of action which would affect subsequent recommendations.

14. Given the purposes for which the Special Commission for the Enterprise was established by resolution I and the nature of its mandate, a distinct line of work can be seen in the need to identify, and act on, those matters determining the ability of the Enterprise to effetively embark upon its first operation(s), some of which concern also the implementation of the regime established by resolution II. It would thus seem advisable to consider determining the scale and mode of its first operation, and the cost implications, on the basis of which the initial fund for the Enterprise will be assessed. The cost implications are, moreover, a matter of direct interest to all potential States Parties to the Convention.

Organizational aspects

15. The Enterprise will be formed as an international institution, on the basis of its statute, with the function of carrying out exploration and exploitation in the Area, as well as transport, processing and marketing activities. It will be an organ of the Authority and subject to its control and directives, but will none the less enjoy autonomy in the conduct of its operations, having for this purpose separate legal capacity to enter into contracts, joint and other arrangements, including agreements with States and international organizations, to conduct property transactions and to sue and be sued in its own name before international and national tribunals. The Enterprise is to have financial independence and is expressly required to operate on sound commercial principles.

16. The Enterprise is an international public enterprise by virtue of the fact that it has an international legal personality deriving from an international instrument, in which its business purpose is also delineated; and that it is provided with a separate management structure and with independent capital. Since international public enterprises often require implementing or operational arrangements (analogous to articles of association or by-laws of private companies), it may be that the Enterprise will also require analogous arrangements. There are several international public enterprises 2/ which may be compared to the future Enterprise in so far as certain basic elements are concerned. These common features may be rendered as follows:

(a) Purpose, a statement of the specific business purpose of the enterprise;

(b) Juridical personality, which may be either expressed or implied from the purposes. The extent of the rights and duties which flow from the endowment of juridical personality are determined by the constituent instrument, which usually stipulates the legal powers required for the operation of the enterprise;

(c) Applicable law, i.e. the law applicable to the organization and functioning of the enterprise, as well as that governing its relations with third parties;

(d) Management structure, i.e., a stipulation of the governing bodies and an enumeration of their functions;

(e) Independent capitalization, involving the raising of funds (and sources), their disposition, and a stipulation of capital management principles;

(f) Privileges, immunities and tax status;

(g) Settlement of disputes. The guarantee of a forum for redress of claims provides an incentive for third parties to enter into business relations with the enterprise. (This is important in view of the privileges and immunities granted the enterprise.) Frequently a mechanism for settlement of disputes internal to the enterprise is also provided. The assignation of liability may also be studied under this heading.

17. The addendum to the present paper contains a list of references to the provisions of the Convention organized according to the above headings. An examination of these basic features of the Enterprise, particularly if undertaken in the context of a review of the constituent instruments and implementing arrangements of selected international public enterprises, would clarify such important organizational questions as the extent of the special rules, regulations, procedures and guidelines that may be needed to govern the Enterprise and its operations, and the extent to which it may exercise autonomy within the management structure of the Authority. An examination of these organizational elements will also assist determination of the initial administrative expenses of the Enterprise (annex IV, article 11, para. 3 (a)).

13. It is not suggested that a similar comparison be made between the operational aspects of the Enterprise and those of other international public enterprises. The tenor and modalities of operations follow directly from the specific business purpose of the enterprise in question and it is difficult to find common elements among such enterprises. Furthermore, the unique status of the resources with which the Enterprise of the Authority will be dealing, as well as the particular nature of the relationship with the Authority, may account for the development of certain pecularities of operations which tend to differentiate the Enterprise from all other international public business endeavours. Also, the fact that provision has been made to meet the initial capitalization and resource allocation needs of the Enterprise, and that there is the requirement for "early entry into effective operation", provide further reason to differentiate the Enterprise from other international ventures.

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Operational aspects

A. Modalities

19. The Enterprise may envisage the undertaking of some or all of the following stages of operations: exploration, exploitation, transport, processing, marketing. A single operation may take various forms: it may cover all stages in an integrated project for the development of a mine site; it may be of smaller scope involving only one or several of the different stages of operations for the development of a mine site; it may link or integrate projects associated with the development of more than one mine site.3/ As to the nature of its ventures, it may carry out an operation on a wholly independent basis (thereby assuming full risk), by contracting stages or aspects of operations (under terms which might limit the risks for the Enterprise), or by entering into joint arrangements (thereby sharing risks according to an agreed formula). Finally, it may be noted that the Enterprise also has the possibility of entering into joint arrangements with entities mining a non-reserved area (article 153, para. 3).

20. While the Convention envisages the use of different operational approaches (see the addendum to this paper for an elaboration by reference to the relevant provisions of the Convention), additional modalities may be envisaged, inasmuch as the general types of approaches indicated in the Convention may lend themselves to additional variables through further breakdown of the elements of each approach and through combinations of various approaches.

21. Identification and analysis of possible options that the Enterprise might exercise would be helped by a compilation and analysis of different models of joint ventures and other forms of association with Governments or State entities that have been used for the exploration and exploitation of oil and mineral resources. The report prepared by the secretariat of the Conference on the Law of the Sea, in 1977, "Costs of the Authority and contractual means of financing its activities", 4/ deals in general terms with these questions. It examines the extent to which the Authority and the Enterprise can draw upon national experience in developing natural resources and provides examples of contractual agreements concluded by Governments of developing countries and foreign enterprises. That report was prepared in reference to the provisions of the Revised Single Negotiating Text but the comments and conclusions contained in it are still valid.

22. The Convention encourages co-operation between the Enterprise and national entities or consortia to enter into joint arrangements through granting various incentives. This type of co-operation was embodied in the Convention in order to ensure that the Enterprise would be in a position to start operations and to compete effectively with the contractors. Entry into joint ventures with experienced mining entities having tested technology seemed an important option to offer as a way of developing technological and financial capabilities.

23. The provisions of the Convention (primarily articles 5, 9, 11 and 13 of annex III) provide for joint ventures and other forms of joint arrangements in the following manner. They:

(a) Give the Enterprise separate legal capacity to enter into joint arrangements;

(b) Envisage such arrangements for reserved areas and for any or all stages of operations. Similar joint arrangements are envisaged for the exploration and exploitation of non-reserved areas;

(c) Provide that financial incentives be offered qualified applicants to enter into joint arrangements with the Enterprise; and provide the same protection from revision, suspension or termination for such arrangements as for contracts;

(d) Expressly permit transfer of technology (and therefore training and manpower development) to take place within the context of a joint venture;

(e) Require that developing countries and their nationals be offered the opportunity to participate in joint arrangements for reserved areas, and establish an obligation under any operative arrangement to give preference to the use of goods and services coming from developing countries;

(f) Provide the assurance that partnership in a joint venture will not give contractors a competitive advantage with respect to land-based miners.

24. Furthermore, the Convention provides the Enterprise with certain assets as a potential partner in a joint arrangement. These are:

(a) Previously prospected sites;

(b) Title to all minerals and processed substances produced by it;

(c) An initial capital of substantial, but as yet undetermined size;

(d) Exemption from making any payments to the Authority for ten (10) years;

(e) Financial incentives for the potential partner as established by the Authority;

(f) Potential privileges, immunities and tax-exempt status.

25. It will be noted that joint arrangements covering exploration and exploitation stages would come under the jurisdiction of the Authority, either as a plan of work (reserved area) submitted by the Enterprise or as a form of contract (non-reserved area) submitted by the entity concerned. A different legal structure would be required for joint arrangements covering subsequent stages of operations, if only to take account of the legal system of the host

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country where the Enterprise may have operations, e.g. field office or a processing plant.

B. The initial operation(s)

26. The parallel system of exploration and exploitation was accepted on certain conditions, one being the undertaking by States parties to assure the Enterprise of the funds required to carry out one fully integrated mining project. 5/

27. According to annex IV, article 11, paragraph 3 (a) 6/ the Enterprise "shall be provided with the funds necessary to explore and exploit one mine site, and to transport, process and market the minerals recovered therefrom and the nickel, copper, cobalt and manganese obtained, and to meet its initial administrative expenses".7/ (The latter funding requirement may best be considered in the context of organizational matters.) The provision establishes an initial fund for an initial project, inasmuch as the promissory notes of States parties are to be deposited shortly after entry into force of the Convention (annex IV, article 11, para. 3 (d) (i)).

28. Determination of the amount required for such an operation, as well as the establishment of criteria and factors for its adjustment, and the related requirement to prepare recommendations for dealing with any shortfall that may arise in the contributions of States Parties, will entail consideration of virtually all factors having a bearing on the Enterprise's entry into operations and its subsequent development.

29. Since the Enterprise will be the "newcomer" to the industry, there is a whole set of considerations in achieving preparedness to enter into operations of the scope, timing and rate comparable, for example, to those of the consortia. While the Convention provides for measures to assure the Enterprise of an optimal financial capability, whether or not the Enterprise would wish to undertake a fully integrated mining project as its first venture is a question which may need close examination.

30. The first step will be to examine closely the concept of such a project to ensure that all the economic parameters of producing and selling a marketable product are taken into account. At the same time it must be noted that the scope of a project, whether comprehensive of all stages or not, whether involving only one mine site or more than one, does not dictate how the project would be undertaken. It may be done on a mainly independent basis; it may use service contracting extensively; it may consist in whole or in part of joint ventures. Thus, it will be necessary to identify the various operational approaches that may be employed within a fully integrated project, since they introduce additional parameters for establishing the costs involved.

31. It appears unavoidable that at least two stages of a fully integrated project would rely on substantial service contracts or the equivalent, no matter what operational method is used for the rest of the project. In the transport stage, either a number of different mining operations will be

serviced by the same shipping company or a number of different companies would be used to service operations at one mine site. In either case, miners would probably contract for freight capacity rather than invest in the shipping sector and would attribute those costs to the exploitation stage. Similarly, miners will be unlikely to place risk capital in power supply for processing, and would rely on long-term delivery arrangements from a power source. Theoretically, it would be far more economic and efficient to build a processing plant(s) to handle nodules of similar composition from different mine sites than to build one plant per mine site. Indeed, it can be argued that the Enterprise is in the best position to promote such an arrangement, particularly in view of the opportunities that would be present for developing country participation.

32. As to the marketing stage, it would be unrealistic to consider establishing a sales and marketing organization within the Enterprise, and especially so if only one mine site at a time is under production, in view of the time and costs involved in developing the specialized skills and contacts required. The effort involved can be attested to by a number of such organizations in developing countries. A marketing service contract would seem to be the feasible option.

33. Because of the financial and other commitments involved, a fully integrated project independently executed would almost certainly exclude the possibility of undertaking additional activities in the same time frame, and since the Preparatory Commission is required to prepare recommendations for dealing with any shortfall in the initial fund, it may be advisable as a first alternative for consideration to examine the ways in which the joint venture approach can be employed within the concept of a fully integrated project.

C. Suggested procedure on the question of the initial operation(s)

34. To determine the desirable scope, nature and costs of the initial operation of the Enterprise, the following procedure is suggested:

(a) Review all elements of a fully integrated project and determine the different operational modes that may be employed within such a project;

(b) Examine feasible alternatives to a fully integrated project and determine the operational modes that may be employed in each case;

(c) Examine legal aspects of the various operational approaches to ensure that they are within the régime established by the Convention;

(d) Determine costs (and related contingencies) of the main variants and compare financial and related requirements.

35. The results of the review will thus provide the basis for determining the scope and nature of the first operation and consequently the amount of the initial fund required. In addition, the findings would facilitate the preparation by the Preparatory Commission of its recommendations pertaining to the initial fund.

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36. The main factors to be taken into account may be summarized as follows:

(a) The availability of two mine sites to the Enterprise in the initial production allocations: implications for the scope and modalities of the first operation(s);

(b) The ability to have exploratory work done under paragraph 12 of resolution II (on a reimbursable basis): implications of the commitment entailed;

(c) The institution of a training scheme: its objectives and modalities will need to correspond to the requirements of the first operation;

(d) Determination of the nature and scope of the incentives to be offered contractors to enter into joint arrangements with the Enterprise, including financial incentives: implications for recommendations relating to the initial operation(s);

(e) Question of the provision of opportunities for participation by developing countries in the operations of the Enterprise;

(f) Measures to ensure availability of requisite technology, bearing in mind that under the joint venture option, the transfer of technology is accomplished within the agreement.

D. Information and study requirements

37. Certain specific requirements in the collection of information and conduct of studies may be identified at this stage:

(a) Information on the parts of areas designated to be reserved in accordance with paragraph 3 of resolution II and reports on the activities of registered pioneer investors and certifying States, received in accordance with paragraph 12 (b) (ii) of resolution II:

> Examination of this information will be important to any decisions on exploration of areas under paragraph 12, as well as for analysis and study of the initial operations and requirements of the Enterprise;

(b) Information on manpower and training in the mining sector relevant to the establishment and development of the scheme called for in paragraph 12:

Such information and consequent decisions on the modalities of a training scheme will be equally important to the examination of the staffing needs of the Enterprise, related personnel training questions and training aspects of acquiring technology. (Attention would need to be given to schemes having as their objective quick and efficient adaptation to the special technologies and administrative needs of sea-bed mining.);

(c) Information and data on technology and technology suppliers:

All technical aspects of mining (and processing) including state-of-the-art assessments, availability and costs, etc., will be important to operational decisions of the Enterprise and to a determination of the initial funding requirements. Given continuous development of mining technology, consideration should be given to the maintenance of a technical information bank;

(d) Information on financial aspects of mining and related service industries:

Information on costs and financing in the mining sector will be needed not only to estimate the initial funding requirements but also for consideration of:

(i) Those financial rules, regulations and procedures of the Authority which "shall ensure the financial independence of the Enterprise" (annex IV, article 11, para. 3 (f));

(ii) The rules, regulations and procedures of the Authority on financial terms of contracts which provide the financial incentives to undertake joint arrangements with the Enterprise;

(iii) The comparative financial aspects of different operational modes, including joint ventures and service contracting;

(e) Information on the different forms of joint arrangements in terms of structure, terms and conditions, conduct of operations, administrative and financial management;

(f) Information on the availability of special services in sectors relevant to the different stages of operations which may be provided on a contract basis.

Summary

38. It will be advisable to begin the work of the Special Commission with a general exchange of views, based on a review of the provisions of the Convention, in order to reach working understandings on substantive questions, in particular the most feasible options that the Enterprise will face, as well as on procedural matters affecting the organization of the Special Commission's work. Moreover, it is clear that a priority and a natural focus for much of the work of the Special Commission can be found in the requirement to prepare recommendations on the initial operation of the Enterprise and the associated cost implications, and to relate such work, wherever applicable, to the implementation of resolution II.

39. It is suggested, therefore, that early attention be also given to a detailed examination of existing joint venture models that may be relevant, and to the development of feasibility studies focusing on the alternative operational modes that the Enterprise may employ. At the same time, it would also be useful to prepare a working draft of a hypothetical joint venture agreement for the exploitation of a reserved area 8/ in order to highlight the prospects and contingencies of that approach to the initial operations of the Enterprise.

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Notes

1/ For Conference discussion on this provision, see Official Records of the Third United Nations Conference on the Law of the Sea, vol. XIII (United Nations publication, Sales No. E.81.V.5), document A/CONF.62/C.1/L.27, chap. III, para. 9.

2/ Particular mention may be made of INTELSAT, INMARSAT, EUROCHEMIC and the Interim Arrangements for a Global Commercial Communications Satellite System. Reference should also be made to document C.1/Working Paper No. 5 of 5 April 1975 which contains an analysis of international enterprises similar to that suggested in paragraph 16 above, but done from the point of view of international joint venture models.

3/ Examples of projects involving the development of more than one mine site would include the combining of exploration activities in two adjacent areas, the recovery of nodules from two areas (e.g. adjacent reserved and non-reserved areas, or two having bottom conditions for which a special recovery technology has been developed), and the processing of nodules from different mine sites, including those of other entities.

4/ Official Records of the Third United Nations Conference on the Law of the Sea, vol. VII (United Nations publication, Sales No. E.78.V.3), document A/CONF.62/C.1/[illegible]

5/ See the report of the Chairman of the First Committee on the negotiations in the First Committee, Official Records of the Third United Nations Conference on the Law of the Sea, vol. XII (United Nations publication, Sales No. E.80.V.12), document A/CONF.62/L.43.

6/ The subject of article 11 of the statute of the Enterprise is its "finances"; its "operations" are dealt with in the following article 12. However, article 11 of annex IV is the only provision in the Convention which deals with the first as opposed to any operation of the Enterprise.

7/ The reason for the inclusion of the specific reference to the production of the four metals was given in the report of the Co-ordinator concerned (see Official Records of the Third United Nations Conference on the Law of the Sea, vol. XIII, document A/CONF.62/C.1/L.27, chap. III, para. 6): it was done to ensure that all the criteria were given for estimating the amount required to carry out such a project, and not because the Enterprise would be compelled to process and market all four metals if it were economically unfeasible to do so.

8/ At least one attempt has been made to draft such an agreement: see Jaenicke, Schanze and Hauser, "A joint venture agreement for seabed mining", Studies in Transnational Law of Natural Resources, vol. 5 (1981).

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LOS/PCN/SCN.2/WP.1/Add.1
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ORIGINAL: ENGLISH

Preparatory Commission for the International
Sea-Bed Authority and for the International
Tribunal for the Law of the Sea
Special Commission 2

SPECIAL COMMISSION FOR THE ENTERPRISE MANDATE AND PROGRAMME OF WORK

Background paper by the Secretariat

Addendum

LIST OF PROVISIONS OF THE UNITED NATIONS CONVENTION ON THE LAW OF THE SEA DEALING WITH ORGANIZATIONAL AND OPERATIONAL ASPECTS OF THE ENTERPRISE

I. ORGANIZATIONAL ASPECTS

(a) Purpose

Articles 158(2), 170(1)

Annex IV: articles 1(1), 12(7)

(b) Juridical personality

Articles 158(4), 170(2)

Annex IV: articles 2(2), 2(3), 13(2)

(c) Applicable law

Article 170(2)

Annex IV: articles 1(2), 2(1)

(d) Management structure

(i) Governing Board

Articles 160(2)(c), 162(2)(c)

Annex IV: articles 4, 5, 6, 11(2)(a), 11(3)(d), 11(3)(f), 12(3)(c), 12(6)

(ii) Director General and staff

Articles 160(2)(c), 162(2)(c)

Annex IV: articles 4, 6(o), 7, 11(4)

(iii) Role of the Authority

General

Annex III: article 12(1)

Assembly

Articles 160(1), 160(2)(c), 160(2)(f)(ii), 160(2)(h), 160(2)(i), 160(2)(n), 170(2)

Annex IV: articles 2(1), 5(5), 10, 11(3)(f)

Council

Articles 162(1), 162(2)(c), 162(2)(g), 162(2)(i), 162(2)(k), 162(2)(l), 162(2)(o)(ii), 162(2)(w), 162(2)(z), 170(2)

Annex IV: articles 2(1), 5(5), 9(1), 11(2)(a), 11(3)(f), 11(5), 12(1), 12(2), 12(3)

(e) Independent capitalization

Articles 170(4), 173(2)(b)

Annex IV: articles 10, 11

/...

(f) Privileges, immunities and tax status

Article 177

Annex IV: article 13

(g) Settlement of disputes

Articles 187(b), 187(c), 188(2)

Annex III: article 5(4)

Annex IV: articles 2(3), 3

II. OPERATIONAL ASPECTS

(a) Right to apply for any part of the Area

Annex III: article 3(2)

(b) Reservation of areas

Annex III: articles 7(6), 8, 9, 14(3)

(c) Submission, approval, execution of projects and plans of work

Articles 153(3), 162(2)(j)

Annex III: articles 3(1), 3(2), 5, 6, 7(6), 9, 11(1), 11(3), 12(2), 13(1)(d)

Annex IV: articles 6(c), 6(d), 6(f), 6(g), 6(j), 12(1), 12(2), 12(3)

Production authorizations:

Article 151(2), 151(7)

Annex IV: article 6(e)

Title to minerals and processed substances:

Annex III: article 1

Annex IV: article 12(4)

Marketing:

Annex III: article 13(7)(a)

Annex IV: article 12(5)

/...

(d) Operational options

(i) Scope

All phases

Article 170

Annex IV: articles 1(1), 11(3)

Exploration and exploitation

Article 153(3)

Exploration or exploitation

Annex III: article 3(4)(c)

(ii) Contracts for different phases or aspects of activities

Annex III: article 9(2)

Annex IV: article 12(3)

(iii) Joint ventures for exploration and/or exploitation of reserved areas with qualified developing country applicants

Annex III: articles 9(1), 9(4)

Annex IV: article 13(2)(a)

(iv) Joint ventures for exploration and/or exploitation of reserved areas with entities eligible to apply for contracts for non-reserved areas. (Inclusion of developing States and their nationals.)

Annex III: article 9(2)

Annex IV: article 13(2)(a)

(v) Joint arrangements between the contractor and the Authority through the Enterprise (e.g. joint ventures or production sharing) for exploration and exploitation of non-reserved areas

Annex III: articles 11, 13(1)(d), 13(14)

Annex IV: article 13(2)(a)

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(e) Financing

Sources

Articles 170(4), 173(2)(b)

Annex IV: article 11

Initial financial requirements

Annex IV: article 11

Loans and debt guarantees

Annex IV: articles 6(m), 11(2), 11(3)

Net income

Articles 160(2)(f)(ii), 171(c)

Annex IV: articles 6(h), 10, 11(1)(d)

Financial reports and statements

Articles 160(2)(i), 162(2)(g)

Annex IV: articles 6(k), 9

(f) Technology and training

Articles 144, 150(d), 273, 274(a)

Annex III: articles 5(1), 5(3), 5(5), 5(6), 5(7), 13(1)(d), 15

Annex IV: article 6(f)

Definition of technology

Annex III: article 5(8)

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UNITED
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UNITED NATIONS
CONVENTION ON THE
LAW OF THE SEA

LOS/PCN/SCN.2/WP.2
17 July 1984

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2

THE ENTERPRISE

Start-up requirements and preparatory measures

Background paper by the Secretariat

INTRODUCTION

1. Special Commission 2 had requested the Secretariat to prepare an issue-raising paper on paragraph 12 of resolution II and a note on the start-up requirements of the Enterprise. These two requests address the two primary objectives of preparations for the Enterprise:

(a) The operational objective of ensuring that it can keep pace with other operators in the Area; and

(b) The institutional objective of ensuring its early entry into effective operation.

While these are distinguishable goals, there is an extensive overlap: some issues, primarily that of developing human resources, are common to both; and, given the purposes of the Enterprise, the goal of effective operation merges with that of achieving and maintaining an appropriate pace of project activity. For this reason, the two requests have been dealt with in one working paper.

2. The paper deals first with the early Enterprise - how it will be established, and what its first activities will be - in order to establish a basic frame of reference in which to consider the nature and scope of the planning work of Special Commission 2. Paragraph 12 of resolution II is then considered, in the context also of the planning necessary to meet the start-up requirements of the Enterprise.

3. Particular attention is paid throughout this paper to those factors which may help Special Commission 2:

(a) To identify which planning approaches will facilitate the flow of finance, technology and expertise into the Enterprise;

(b) To determine which measures can be effectively taken by the Commission on behalf of the Enterprise;

(c) To determine more precisely the nature and extent of the assistance to be rendered by pioneer investors and certifying States;

(d) To identify the start-up requirements of the Enterprise under any strategy it may adopt to the development of its operational capabilities;

(e) To place in perspective the financial requirements of the Enterprise.

4. The paper therefore places emphasis on the need for Special Commission 2 to establish various mechanisms for ensuring:

(a) The close co-operation and collaboration of pioneer investors and certifying States;

(b) The development of managerial expertise for the Enterprise;

(c) The availability of comprehensive information and the capability to monitor relevant developments.

I. THE EARLY ENTERPRISE

5. The flow of activities in the start-up period is briefly rendered in the following paragraphs, in order, by extraction, to identify the basic planning responsibilities of the Special Commission.

A. Establishment of the Enterprise

6. The sequence of events for the establishment of the Enterprise, as built into the Convention, may be rendered as follows:

(a) Elections by Assembly; establishment of Council;

(b) Actions by the Council:

- Recommendations for Governing Board and Director-General;
- Policy formulation;

(c) Actions by the Assembly:

- Election of Governing Board; fixing remuneration of members; election of Director-General;
- Adoption of general policies relevant to the Enterprise;
- Adoption of rules, regulations and procedures on financial management and internal administration of Authority;
- Assessments of States Parties' contributions;

(d) Establishment of Governing Board:

- Election of Chairman; adoption of rules of procedure;

(e) Actions by Governing Board:

- Adoption of rules, regulations and procedures on organization and management, including internal financial management and staffing;
- Initial budget (administrative expenses);
- Delegation of powers to Director-General (requires Council approval);
- Procedures for reporting to Council; possible consultations on expediting any matter requiring Council approval at the early stage; recommendations on interorganizational processes (working relationship between Governing Board and Council);
- Initiation of corporate planning (setting of goals, strategies for three years and five years approximately);

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(f) Actions by Director-General:

- Recruitment/staff development;
- Instructions on initial organization, management and financial affairs; relations with Secretary-General of Authority;

(g) Approvals by Council/Assembly, e.g. budget.

7. To establish the Enterprise as quickly as possible the Preparatory Commission could:

(a) Open a roster of candidates for staffing of the Enterprise (i.e. the Commission begins the "talent search");

(b) Prepare draft rules, regulations and procedures on initial organization, management and staffing; recommend special procedures to expedite recruitment process (recommendations on organization and structure would be largely reflected in the roster suggested above);

(c) Propose an (administrative) budget for first two years (staff costs, physical facilities, etc.);

(d) Make recommendations, as appropriate, on sharing of administrative expenses with Authority and on dealing with any shortfall in financing affecting administrative expenses;

(e) Prepare draft rules of procedure of Governing Board;

(f) Prepare draft agreement for principal office of Enterprise.

It will be noted that in these listings "initial administrative expenses" are separated from the finances needed for operations (see annex IV, art. 11, para. 3 (a)).

8. The Enterprise could not be considered as fully established until its management structure is in place. Assuming that the staff of the Authority could be drawn upon in the first years for some administrative and other support services, the Director-General would need an initial staff of approximately 30, estimated as follows: 4 senior managers (general management, finance and economics, engineering, manpower development), 17 engineers and scientists, 1 lawyer and 8 supporting staff. The establishment process would take about two years, estimated as follows:

Talent search	6 months
Recruitment process leading to final selection	6 months
Getting person in position	3 months
Breaking in/training	6 months
Reaching peak efficiency	3 months
Total	24 months

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B. Commencement of functions

9. Toward the end of, or during this same two-year period, depending on the extent of prior actions by the Preparatory Commission, the following steps may be outlined:

(a) Adoption of a human resource development strategy encompassing:

(i) On-the-job training;

(ii) Setting up of counterpart groups when external consultancy services are used;

(iii) Continuing education;

(iv) Access to a research and development-cum-training facility;

(v) Strategies in case of entry into joint arrangements for operations;

(vi) Requirements as regards training by contractors operating in non-reserved areas;

(b) Adoption of a strategy for technology acquisition (see annex II);

(c) Adoption of guidelines and procedures on financing of operations, requiring:

(i) Examination of available means of minimizing capital/loan requirements;

(ii) Evaluation of States parties financial contributions (on advice of Assembly);

(iii) Adoption of rules on borrowing and repayment of loans (requires Council approval);

(d) Elaboration of an optimal pattern of working project arrangements as part of overall corporate plan (see LOS/PCN/SCN.2/WP.1 and Add.1 for an elaboration of the operational options permitted the Enterprise under the Convention);

(e) Formulation of a general programme of activities and scheduling of financial requirements, in light of or consequent upon:

(i) Policies set by Council and Assembly;

(ii) Evaluation of reserved areas;

(iii) Assessment of economic and technical feasibility of entering into operational phase and tentative selection of technology components to configure systems;

(iv) Assessment of operational options available;

(v) Progress in human resources development;

(vi) Indications as regards contract needs, joint and other arrangements, including agreements with States and international organizations;

(vii) Establishment of procedures on contracting of goods and services, including consultancy services;

(f) Notification to Authority of intention as regards reserved areas; and drawing up of a formal plan of work showing:

(i) Scale, timing and modality of mining operation proposed;

(ii) Scale and timing of financing;

(iii) Terms and conditions of joint venture if applicable;

(iv) Technology system to be used and, if called for, requests to Authority to apply transfer of technology provisions.

10. After the plan of work is approved, the Enterprise would, according to the approaches selected, proceed:

(a) To negotiate technology acquisition (or assemble technology components to be configured into a system);

(b) To negotiate a joint venture or other form of joint arrangement;

(c) To let out contracts;

(d) To enter into any legal agreements and transactions required;

(e) To raise the financing required (Council approval for loans);

(f) To further escalate the recruitment/training process.

Under favourable conditions, the Enterprise would start to function in the third year after entry into force and would be ready to enter the pre-investment stage of operations in the fifth year (see annex I, chart 1 below).

11. Again, the ability of the Enterprise to hold to such a timetable would be dependent on prior work done by the Preparatory Commission, particularly with respect to:

(a) Developing a managerial team completely familiar with all preparations and planning for the Enterprise;

(b) Evaluating reserved areas;

(c) Evaluating economic and technical feasibility of mining and processing operations, which presupposes that the Commission will have made a comprehensive assessment of technology components available on open market, conducted market surveys, etc.;

(d) Evaluating operational options;

(e) (i) Costing of operations;

(ii) Determining optimal debt/equity ratio and examining various methods of financing, including role of supplier's credits, consumer's credits, equipment-leasing schemes, etc., in reducing capital/loan requirements;

(iii) Preparing draft rules applicable to financing of operations;

(f) Preparing draft rules on procurement of goods and services and on joint arrangements of the Enterprise.

12. The Preparatory Commission may be able to pursue these tasks to the extent of:

(a) Making a tentative selection of site(s) for project evaluation;

(b) Proposing an optimal pattern of working project arrangements;

(c) Preparing a draft policy framework for consideration by Assembly/Council, including guidelines for joint ventures, technology acquisition and other elements which would facilitate the elaboration of the first corporate plans of the Enterprise.

13. It will be noted that the indications given above as to the possible scope and detail of the Commission's preparations would not have the effect of imposing a definitive structure on the Enterprise, or of deciding on its strategy towards technology acquisition, or of determining the location, timing and scale of its operations, or the operational modalities that it may employ. Under any approach to planning it will be important to avoid limiting the organizational and operational options available to the Enterprise and to preserve its ability to respond rapidly and effectively to opportunities as they arise.

C. Measures for facilitating start-up

14. There is, however, one important aspect to the start-up requirements of the Enterprise where prior action by the Preparatory Commission may be warranted. Under even the most conservative estimate the Director-General of the Enterprise would need an initial staff of approximately 30. The four senior-level managers would need to be in place as soon as possible in order to pursue without unnecessary interruption or duplication the developmental work begun by the Preparatory Commission.

15. As estimated above in paragraph 8, it would take nearly two years to put the initial core staff in place, although some reduction in time might be possible if the Commission were to facilitate the formation of the managerial team required.

16. Following the receipt of the sixtieth instrument of ratification, the Preparatory Commission will be entering the final phase of its work: it will know not only the date of the commencement of the first session of the Assembly, but also who most of the members of the Authority will be, and which registered pioneer investors will be likely to apply for contracts. It is in that period also that it will be possible to draw up a firm timetable and agenda for the development of the Enterprise and to justify taking decisions on the initial staffing needs.

17. Given the first activities of the Enterprise - review of the preparatory work done by the Preparatory Commission, corporate planning, formalization of a general programme of activities, scheduling of financial and manpower requirements, negotiation of operational agreements and arrangements - the most urgent requirement of the Enterprise will be for a team of senior-level managers familiar with the requirements of the Enterprise and with the operational planning processes of the sea-bed mining industry in general. This requirement, of course, relates equally to the Director-General himself and to the members of the Governing Board.

18. The Commission could arrange for the selection of key experts, particularly those at the senior management level, and for their recruitment under a temporary arrangement to be subsequently confirmed by the Enterprise. Possible methods for covering the administrative expenses involved might be:

(a) To agree to utilize the application fees paid by the pioneer investors in connection with their registration; or

(b) To obtain General Assembly approval to reimburse costs incurred by the United Nations from the Enterprise's initial administrative budget.

19. The selection process involved could be seen as linked to the provisions of paragraph 12 (a) (ii) of resolution II, which calls on the Commission to "designate personnel" for training for the Enterprise. The act of designating a body of persons for training may in any event be regarded as introducing an element of advance recruitment for the Enterprise if, that is, the Preparatory Commission is not to serve as a "talent search" agency to the benefit of pioneer investors or other operators in the Area. The Preparatory Commission will need to consider what commitment the future Enterprise should have to persons designated under paragraph 12 of resolution II, what evaluative procedures would need to be applied, what conditions might need to be imposed on designated personnel as regards, for example, acceptance of employment with pioneer investors, and what measures would have to be introduced to help ensure that the persons designated can function as a team.

20. In addition to the connection that can be made between the training provision of resolution II and the mandate to ensure early entry into effective operation by virtue of the designation of personnel on the one hand, and possible prior selection of staff for the Enterprise on the other, there is also a connection to be made in terms of the kinds of preparatory training or acquired experience that will be most desirable. Whether designated as trainees or as future Enterprise experts, it would be most advisable to ensure that the individuals concerned are totally familiar with the work of the Preparatory Commission, in particular that of its Special Commission 2. One means of ensuring this would be to attach them to the Secretariat for specific periods as required.

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II. PREPARATORY MEASURES

A. Role of paragraph 12 in preparing the Enterprise

21. Resolution II gives registered pioneer investors exclusive rights to a pioneer area, thus promoting continued pioneer investment in mine site evaluation and operational planning, and gives them specific assurances and guarantees that they can exercise the rights acquired when the Convention enters into force. It gives somewhat less specific guarantees and assurances to the Enterprise, which are none the less intended to be of comparable value.

22. First, resolution II introduces the banking system into the preparatory period and allocates two production authorizations to the Enterprise in order to facilitate rapid development of Enterprise activities. Under the Convention, an area would not be designated as reserved until the plan of work of the applicant had been approved and the contract signed (annex III, art. 8). When resolution II was being drafted (see historical note, annex III, below), there was disagreement over the correlation between the number of banked sites and the early entry into effective operation of the Enterprise, although it was clearly unacceptable that only some pioneer investors should present a site for the Enterprise, leaving others free of this obligation.

23. Secondly, resolution II seeks to give guarantees on a timely flow of funds, technology and expertise into the Enterprise (see preamble). It does so, in its paragraph 12, by imposing obligations on pioneer investors and their certifying States. It addresses also the informational needs of the Commission (and the Enterprise) by imposing a reporting responsibility on certifying States, and the possible need to firm up information and data on reserved areas or otherwise accelerate mine site evaluation and therefore operational planning, by imposing an "exploration" obligation on registered pioneer investors.

24. The fundamental purpose of imposing obligations on those who would benefit from the interim régime is to enable the Enterprise to keep pace with other operators in the Area, as stated in the chapeau to paragraph 12. Viewed as a responsibility of the Commission, the implementation of paragraph 12 may require exercising a certain judgement as to the likely future pace of activities by registered pioneer investors, and anticipating, to some extent, the likely operational decisions of the management of the Enterprise. A crucial stage would arise if there were evidence of a readiness to proceed expeditiously to exploitation, and if a real timetable had been established with the knowledge of the date of the entry into force of the Convention. In such circumstances, the Commission would need to consider taking action on behalf of the Enterprise according to its judgement as to how far the Enterprise would be left behind and/or how much its later commercial viability would be affected if it did not.

Internal timetable of paragraph 12

25. While the actions supporting the future development of the Enterprise's capabilities are to be taken by the pioneer investors and their certifying States, or both, they are predicated on decisions by the Preparatory Commission.

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Exploration work is not carried out until the Commission has decided to so request, and training is not provided until the Commission has decided to designate personnel. Evidence of active pioneer work would be one essential prerequisite for taking such decisions. It may be further argued that there is an element of decision-making by the Commission concerning technology. Since the undertakings on transfer of technology are given within six months following the entry into force of the Convention, in accordance with paragraph 8 (a) of resolution II, the provision in paragraph 12 concerning this undertaking may imply a judgement by the Commission as to when, prior to entry into force, the receipt of that undertaking would be meaningful in helping to assess the feasibility of different approaches that can be adopted to the development of the Enterprise's technological capabilities (see annex II below).

26. The decisions of the Commission, consequent to which the registered pioneer investors perform their obligations, can only be taken in the light of external developments, its overall planning framework and the planning stage reached where a decision denoting a commitment to a course of action can be justified. Furthermore, such commitments entail actions which will be binding on the future Enterprise. The commitment that would follow an exploration request is clear: presumably, reimbursement of the expenses incurred will be a first call on the funds of the Enterprise or will be absorbed within a plan of work for that reserved area.

27. Finally, it may be observed that there is no absolute requirement in paragraph 12 as to when all the obligations must be fulfilled. It is possible to infer two approaches: (a) if implemented before entry into force of the Convention, the Commission would in fact be adapting and bringing forward into the preparatory period provisions of the Convention such as article 2, paragraph 1 (a), article 15 and article 5, paragraphs 1 and 3 of annex III; (b) if initiated in the preparatory period but implemented following entry into force, the Commission would be adding obligations to those contained in the provisions of the Convention in order to maintain the rule that pioneer investors have special obligations as compared to other operators. Paragraph 13 of resolution II would cover both cases.

28. As has been suggested in paragraph 16 of this paper, there will be a critical period in the timing not only of the implementation of the provisions of paragraph 12 of resolution II, but also for the adoption of measures which will facilitate meeting the start-up requirements of the Enterprise. In fact, the critical period may be considered as extending into the period up to six months after entry into force of the Convention, encompassing the time during which the Enterprise's financial situation will be made clear and the time when registered pioneer investors would be exercising the rights acquired under resolution II, with consequent effects such as an acceleration of the flow of information into the Enterprise. It is noted that the Preparatory Commission only goes out of existence at the end of the first session of the Assembly of the Authority, and it is feasible to assume that this first session would be a lengthy one. This overlapping of régimes, the interim with the definitive, and theoretically of institutions, the Authority and Enterprise, with the Preparatory Commission, may create special opportunities for facilitating the commencement of Enterprise functions. This may be particularly important for effective utilization of the exploration provision of paragraph 12 (see sect. B below).

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29. Implementation of the provisions of paragraph 12, particularly those on exploration and training, need to be looked at in the context of an expected sequence of events, beginning with the registration of pioneer investors and ending with the eventual exploitation contracts. Within that period there would be two distinct phases: the first would begin with the registration of pioneer investors and end with the sixtieth ratification or accession; the second would start on that date and end six months after the entry into force of the Convention, by which time the pioneer investors would have submitted their plans of work. In the first phase, the Commission would be establishing the general requirements of the Enterprise; in the later stage, it would be elaborating more precise requirements and considering taking actions such as preparing a roster of candidates for the staffing of the Enterprise, arranging high-level training, preparing the final budget plan, and such other possible actions as discussed in sections A and C of this paper.

Consultative mechanism for implementation of paragraph 12

30. It is to be noted that the provisions of paragraph 12 are at once the obligations of pioneer investors and certifying States and the functions of the Commission in accordance with paragraph 8 of resolution I, and that under paragraph 13 of resolution II, the future Authority is bound to recognize and honour these obligations and the decisions of the Preparatory Commission taken pursuant to paragraph 12. An important element of the responsibility of all concerned - the Preparatory Commission itself, the pioneer investors and the certifying States - will be to ensure that actions taken will not have the effect of promoting movement from an interim and provisional system into a definitive and permanent one. Special Commission 2 would therefore need to subject any proposed method for implementing paragraph 12 to some general tests. These may be posed as follows:

(a) Whether it exceeds the purpose set forth in the chapeau to paragraph 12, taking account of the preamble to resolution II and the emphasis on "early entry into effective operation" of the Enterprise in paragraph 8 of resolution I;

(b) Whether it is appropriate to the preparatory period;

(c) Whether it imposes undue responsibilities and liabilities on the Authority and Enterprise;

(d) Whether it is supportive of and harmonious with the recommendations that Special Commission 2 will have to make on general operational and organizational matters and with the rules, regulations and procedures to be drafted by the Preparatory Commission for provisional application by the Authority.

Should a transitional phase be recognized during the preparatory period (e.g. following upon establishment of the date of entry into force of the Convention), such guidelines could be relaxed considerably.

31. Irrespective of any guidelines that may be formulated, the propriety of many decisions or measures that may be proposed with respect to the implementation of paragraph 12 will be largely dependent upon the co-operation and collaboration of

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pioneer investors and certifying States. Considering that the way in which the interim régime is applied and the extent to which the Convention régime can be adapted to the preparatory period on behalf of the Enterprise are matters of ensuring that the guarantees and assurances given the Enterprise are of a value comparable to those granted pioneer investors and their certifying States, a comprehensive tripartite consultative mechanism (Commission/pioneer investors/certifying States) would be an essential prerequisite for implementation of paragraph 12. Particular subjects for such consultations are identified in the following section which examines the individual provisions of paragraph 12.

B. Specific elements of paragraph 12

32. The preamble to resolution II recognizes the need to ensure that the Enterprise will be provided with the finance, technology and expertise necessary to enable it to keep pace with registered pioneer investors. The chapeau to paragraph 12 does not specify that the purpose of imposing obligations on pioneer investors and their certifying States is to ensure that the Enterprise can keep pace with them in particular. However, the provisions of that paragraph address the same needs for finance, technology and expertise as does the preamble. In addition, of course, paragraph 12 provides for a regular flow of information into the Commission and for continued mine site evaluation activities in reserved area(s), should the Commission so decide.

1. Funds

33. The reason for placing the responsibility to ensure that the necessary funds are made available to the Enterprise in a timely manner on certifying States as opposed to pioneer investors is clear: the reference in paragraph 12 (b) (i) to the provisions of the Convention is clearly to annex IV, article 11, paragraph 3. It can be asked whether a certifying State's responsibility as a State party under annex IV, article 11 would be any greater at that time than that of other States parties who are not sponsoring entities for contracts with the Authority. In other words, does this obligation of the certifying State continue to exist if it is not sponsoring an entity for a contract with the Authority? It may also be queried whether this obligation places an obligation upon certifying States to ensure that all the necessary funds for the first operation are available to the Enterprise in order to ensure that it can keep pace with other operators.

34. It remains to be established, preferably through consultations with certifying States, what special assurances can be given or what assistance can be rendered to meet the Enterprise's financial requirements. Certifying States could, for example, play a special role in the work necessary to determine the costs of a fully integrated venture according to all possible variants and options. Certifying States can also be encouraged to look at the question of the kinds of measures that could be suggested to the Assembly at its first session to deal with any shortfall that might occur in the funding of the initial operation and in meeting the initial administrative expenses of the Enterprise.

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2. Technology

35. During the same process by which areas are being reserved under the Convention, applicants are making available to the Authority "a general description of the equipment and methods to be used in carrying out activities in the Area, and other relevant non-proprietary information about the characteristics of such technology and information as to whether such technology is available" (annex III, art. 5, para. 1). The contract when signed (and the reserved area consequently designated under art. 8 of annex III) would contain standard undertakings on transfer of technology as contained in paragraph 3 of article 5 of annex III. If the entities have registered pioneer status, those undertakings would be included in their plan of work submitted within six months of entry into force of the Convention (under para. 8 (a) of resolution II), and would be preceded, in the period before entry into force, by the undertaking referred to in paragraph 12.

36. Some clarification may be needed as to the relationship among paragraphs 8 (a) and 12 (a) (iii) of resolution II and article 5, paragraphs 1, 2 and 3 of annex III of the Convention, in order to help determine the nature of the pioneer investor's obligation with respect to ensuring that the Enterprise will have the technological capability needed to keep pace with other operators in the Area. The certifying States may also be regarded as having a role in this respect, inasmuch as they may subsequently be required to assist the Enterprise, under paragraph 5 of article 5 of annex III, should its inability to commence mining and processing operations "in a timely manner" be attributable to problems in acquiring appropriate technology.

37. The Commission may wish to address itself to a number of questions relating to the undertakings referred to in paragraph 12 (a) (iii), including the type of technological information to be provided by the pioneer investor and the possible role of the certifying State in facilitating the planning and effective operation of the Enterprise. The ability of the Commission to give preliminary answers to questions concerning the availability of efficient and useful technology will be of great value to the Enterprise, since the option it adopts for the acquisition of technology (see annex II below) may be a direct result of the quality of the information available to it. The Special Commission has already taken cognizance of this requirement in adopting item 5 (b) in its programme of work (LOS/PCN/SCN.2/1984/CRP.1).

38. The periodic reports of the certifying States would be useful in this connection. There may be some merit in having certifying States supply or confirm information on technology of a non-proprietary nature and in general take a lead role in the development of a technological information bank by the Commission.

3. Expertise

39. The purpose of paragraph 12 (a) (ii) is, in accordance with the chapeau, to ensure that the necessary expertise will be available for the mining operations of the Enterprise. If indeed it can be guaranteed, already during the preparatory period, that the necessary operational expertise will be available, then there will be a greater assurance also of early entry into effective operation of the Enterprise.

40. The provision may be viewed as anticipating the application of the training provisions of the Convention (see arts. 2, para. 1 (b), and 15 of annex III), and as recognizing that the training that can be provided by pioneer investors will be of more value in meeting the Enterprise's needs than training that can be provided under more conventional arrangements.

41. Setting aside for the moment questions of the relationship between these training provisions and the broader question of human resource development for the Enterprise, and considering only the possible scope of paragraph 12 (a) (ii), certain clarifications may be useful, for example:

(a) Would training opportunities be offered by the pioneer investor only during the interim period and in the context of its activities in the pioneer area?

(b) If the obligation is delayed until after entry into force of the Convention, what form might the training take, in order to preserve the notion that the obligation of the registered pioneer investor should be greater than that of an applicant not having that status?

(c) Should training only be of a practical nature and of direct relevance to the operational and managerial needs of the Enterprise?

(d) Should training be provided at senior, middle and junior levels, and encompass all professional and technical areas required for the conduct of operations?

(e) Should all training be accomplished according to policies and guidelines established by the Preparatory Commission? And should the exact nature of the training provided and the extent of the direct involvement in pioneer activities be determined by the pioneer investor in consultation with the Preparatory Commission?

(f) Since the provision refers to "personnel", would the Commission designate a body of persons for training according to its estimate of the (early) manpower requirements of the Preparatory Commission?

(g) Can it be assumed that all pioneer investors can provide useful training? How otherwise can the burden be apportioned equally amongst them?

(h) While all training would be provided without charge, should an exception be made for special or additional training conducted within the context of exploration of a reserved area?

42. The first three queries relate to the very purpose of creating such an obligation and placing it on the pioneer investor. The most valuable training would be practical rather than theoretical, and encompass all facets of mine project development. Only the pioneer investor is in a position to offer such opportunities. It would be incumbent upon the Preparatory Commission when selecting personnel for placement with pioneer investors to ensure that they already have the necessary professional or technical background and qualifications to benefit from the special opportunities offered by pioneer investors. Since the pioneer investor is registered in respect of a pioneer area and has the right to

pursue activities which under the Convention would be conducted under a contract for exploration, it would follow that the training obligation would be performed in respect of pioneer activities. These assumptions should perhaps be made explicit. A number of questions will, in any event, arise as to the extent to which the pioneer investor can be expected to actively involve a trainee in sensitive work.

43. A basic question to be addressed is the extent to which the types and levels of training and the involvement of trainees in pioneer activities would need to be regulated by the Preparatory Commission. If it were to be assumed that training would be provided fully at the discretion of the pioneer investor, it would also have to be assumed that pioneer investors would consult each other to reach agreement on a number of points, such as how to share the burden equally and how to allocate the personnel in such a way that will produce the team of managers and experts for the Enterprise, anticipated by the Preparatory Commission in its designation of the personnel to be trained.

Training/exploration/technology

44. Pioneer investors could either carry out training in the context of activities in the pioneer area or in the context of exploration of the corresponding reserved area, if that has been requested. Since training is to be provided without charge a case may be made, in the interests of both ensuring equity among pioneer investors and of reaching the most efficient arrangements for exploration, for restricting the training obligation of the pioneer investor to the pioneer area and making training associated with activities in the reserved area part and parcel of the exploration arrangement.

45. While there would be opportunities for practical training in technology by virtue of a pre-exploitation régime which provides the necessary guarantees for pursuing technology development and testing, the most important training lies not in the development of skills in the use of a particular technology, but in the development of the capabilities needed to assess technology development, compare available technologies, configure systems, and negotiate terms and conditions for the acquisition of the technologies selected. Actual training in the use of the technology selected, if that is the option adopted by the Enterprise to the acquisition of its technology capability, would be part of the final technology agreement (see definition of technology in annex III, art. 5, para. 5). Training should be designed in such a way that designated personnel are familiarized with the processes of evaluating the technology developed in the pre-exploitation stages, and with the role technological feasibility plays in determining overall operational feasibility.

Designation of personnel for training in accordance with estimated manpower requirements

46. The relationship between designation of personnel, determination of start-up requirements, and measures taken to facilitate the recruitment of Enterprise staff has been discussed in the first chapter of this paper. It may be further noted that general estimates of the (early) manpower requirements of the Enterprise - operational and administrative - would serve not only to provide a basis for designating personnel for training but would:

(a) Clarify areas in which training may be indicated;

(b) Provide part of the basis for determining the initial fund of the Enterprise (annex IV, art. 11, para. 3);

(c) Test the viability of different approaches to Enterprise operations, since recruitment and training processes take time.

47. In determining the nature and modalities of training, the Commission may like to make use of the tripartite consultative mechanism suggested in paragraph 31. Timing and duration of training will be a crucial item for discussion. While the Preparatory Commission cannot serve as a recruitment agency, it does however need to ensure that the Enterprise can be established without delay. Ideally, personnel should be designated only when there would be little or no problem of attrition, for example, in the year preceding entry into force of the Convention.

48. If the designation of personnel is considered only in the context of training referred to in paragraph 12, arguments can none the less be made for delaying training of key personnel until such time as:

(a) When the training can be done in a more relevant context (training in prospecting alone, for example, would not be of great value to the Enterprise);

(b) When there would be less likelihood of a high rate of attrition;

(c) When the Commission can feel justified in entering into the commitments entailed, both for the Enterprise and the individuals concerned;

(d) When, as a consequence, the pioneer investors can be assured that their training obligation (for exploration) will not have to be performed all over again, under article 15 of annex III, in respect of a new group of designated personnel.

49. Since it would seem preferable to intimately involve selected experts in the planning activities of the Special Commission from an early stage, consideration can also be given to an approach to human resource development which would commence prior to the actual designation of personnel (see sect. C below).

4. Information

50. The Special Commission faces a major undertaking in establishing and maintaining a broad information base, necessary for its planning and preparatory work. While the reports described in paragraph 12 (b) (ii) would deal primarily or exclusively with pioneer activities, it can be queried whether they are not to be conceived more broadly and encompass the three main elements which paragraph 12 is fundamentally addressing, namely the funds, technology and expertise necessary for the Enterprise. Whether or not the reports are prepared on a regular basis, it is worth considering also requesting reports or comments on selected elements in the work of Special Commission 2 in the light of information available to the certifying State.

51. Finally it is worth noting that these reports would not be related to questions of compliance of pioneer investors with resolution II and decisions taken by the Preparatory Commission under it, since some certifying States will also be registered pioneer investors. On the other hand there is the implication that since under paragraph 1 (c) of resolution II a certifying State stands "in the same relation to a pioneer investor as would a sponsoring State pursuant to Annex III, article 4, of the Convention", this requirement of certifying States in the interim period may be seen as related to "the criteria and procedures for implementation of sponsorship requirements" which are to be set forth in the rules, regulations and procedures of the Authority.

5. Mine-site evaluation (exploration)

52. Some time may have to elapse before reaching the point at which the potential pioneer investors are registered, the reserved areas are known, and the Commission is in a position to proceed to evaluate and compare areas and select one or several for exploration. Since the exploration obligation of a pioneer investor is with respect to an area it had previously prospected (on which it may have information, data and analyses, in addition to that required for registration), the Commission would at the same time be evaluating and comparing the pioneer investors themselves.

53. Both at the point of registration and subsequently, each pioneer investor is likely to be at a different stage of project development. This may possibly be apparent from significant variations in the quality and quantity of information and data on reserved areas, including variations in the amounts expended on obtaining and analysing that data, since pioneer investors may have made their preparatory investments, or incurred subsequent expenditures, in different configurations or according to different schedules and priorities. The periodic reports of certifying States should help the Preparatory Commission to keep abreast of major differences in the activities of the pioneer investors.

54. Any attempt to determine the scope of "exploration" under paragraph 12, by a comparison with "pioneer activities" would need to take account of the progression laid down in resolution II. While it derives from the Convention, it effectively hurdles or foreshortens the sequence as laid down in the definitive system. The sequence of events, beginning with resolution II, may be summarized as:

(a) Achievement of potential pioneer investor status;

(b) Registration as a pioneer investor;

(c) Designation of pioneer area (and reserved area);

(d) Conduct of pioneer activities;

(e) Certification by Preparatory Commission;

(f) Submission of plan of work within six months of entry into force of the Convention (the maximum stage reached being the beginning of the investment period);

/...

(g) Contract approval;

(h) Production authorization;

(i) Start-up of commercial operations, the earliest date being approximately six years after signature of the contract (according to the time periods used by J. D. Nyhart and others, in A Pioneer Deep Ocean Mining Venture, MIT, 1984).

Thus Special Commission 2 will be working within a period beginning at point (c), generally approximating to the completion of prospecting and submission of two areas, as provided for in the Convention, and extending possibly to the end of the pre-investment stage of sea-bed mining, including or overlapping extensively with the period of intensive prospecting and exploration of areas.

55. The Preparatory Commission would be unable to devise a standard rule regarding exploration, not only because each pioneer investor would likely be at a different stage of project development but also because the same activities take place for different purposes and at different rates of expenditure in both the pre-investment and investment stages of project development (i.e. they are not restricted to the prospecting/exploration/exploitation sequence depicted in the Convention). No matter how "exploration" is defined, the activities which may be requested by the Preparatory Commission would have to be geared both to the project development stage of the Enterprise and the project development stage of the pioneer investor from whom it has taken up the reserved area.

56. If an entity were prepared to proceed and complete all activities (and investment) required to embark on commercial production, not knowing when it could take that final step, it would have incurred a major expense without the concomitant guarantees. Requests of the pioneer investor by the Preparatory Commission would only seem justifiable in a situation where the Enterprise could then proceed, apparently without interruption, to the investment stage of mine project development. It may be noted also by reference to article 9, paragraph 1, of annex III that the Enterprise is required to notify the Authority as to its intentions regarding reserved areas.

57. There would be at least four major requirements, prior to considering any action on exploration:

(a) An adequate information and data base on each reserved area, permitting comparisons to be drawn; and the capability to judge which among the reserved areas would be of most interest to the Enterprise;

(b) An information capability for determining when a sufficient level has been reached in pioneer activities, technology development and market conditions, warranting entry into commitments;

(c) A mechanism for consultations with pioneer investors (and certifying States) on the modalities for exploration arrangements;

(d) Achievement of a level of organizational, structural and operational feasibility work and planning which could accommodate exploration activities on a cost-effective basis.

Information and data needs

58. The decision whether or not to embark on exploration activities, when, and with respect to what area or areas, raises special requirements for information and data, including information on financial expenditures. Some questions would be:

(a) Should information and data submitted for purposes of registration and designation of areas be the only set available to the Commission on reserved areas?

(b) Should a step prior to consideration of an exploration request be introduced, namely, a request for supplementary information and data relating to areas that were subsequently reserved, either (i) limited to information and data acquired prior to achieving registered pioneer investor status, or (ii) expanded to include information and data or evaluations thereof acquired in the post-registration period and which may be useful to the assessment and evaluation of reserved areas?

59. The question of the confidentiality of information and data relating to reserved areas is a distinct issue. As it concerns information and data submitted in connection with registration, the issue would be dealt with within the context of the registration rules. If supplementary information and data were to be requested, at a point determined by the Special Commission according to its progress of work and external factors such as perceptibly active levels of pioneer activity, a supplementary set of confidentiality rules may be required, bearing in mind article 14 of annex III on non-disclosure by the Enterprise "to the Authority or to anyone external to the Authority". That article covers data transferred also by prospectors as well as by applicants for contracts.

Possible options for the exploration of reserved areas

60. The Commission will need to consider what possible options it may have for requesting pioneer investors to carry out exploration on behalf of the Enterprise and devise modalities accordingly. Since it would appear to be financially impracticable to conduct more than one or two exploration activities, there is a basic choice between selecting a pioneer investor to explore the area it had submitted in connection with its application for registration, or selecting an area and asking all registered pioneer investors to join in exploring it. In other words, the provision can be implemented either as a single obligation or as a collective obligation of pioneer investors. A collective approach has been proposed in the past (see annex III, para. 4 below).

61. The two approaches can be combined particularly should a joint venture be indicated: the Preparatory Commission could request each pioneer investor, in the period immediately before entry into force of the Convention, to submit to it, for transmission to the Enterprise, a proposed plan of work for intensive prospecting and exploration of the area reserved in connection with its registration. These proposals or draft plans would form the material basis on which the Enterprise would select a site for its commercial operations and, at the same time, choose its partner in a joint venture.

62. Consultations among representatives of the Commission and of each pioneer investor and certifying State would be essential to the question of possibly combining pioneer investor obligations on exploration.

Exploration/technology/training

63. In the post-prospecting (post-reservation of area) stage, one of the important elements in the development of an operational mining plan is the design, fabrication and testing of mining and processing equipment. Evaluation of a reserved area, in the period before entry into force, could involve aspects of technology development, so that a decision to conduct exploration could have implications for the decisions that the Enterprise will take on its initial technology acquisition. If the Preparatory Commission involved itself on behalf of the Enterprise in activities of technology development at an early stage, the cost effectiveness of so doing could be queried. Moreover, if the Enterprise were to decide to lease or purchase proven technology, there would be no need for the Commission, in the preparatory period, to involve it in technology development work.

64. Under any arrangement as regards exploration of a reserved area(s), clearly important training opportunities would be offered. Since exploration of an area represents a major step towards finalization of an operational mine plan, all designated personnel should be intimately involved in the exploration activities.

65. As a further consequence of exploration conducted before the establishment of the Enterprise, special arrangements would have to be made as regards retention of personnel involved and protection of information and data acquired.

C. A possible approach to advancing preparations for the Enterprise

66. Essentially the same questions have been posed throughout the consideration of paragraph 12, namely, the scope of an obligation, if undertaken exclusively within the preparatory period, or if extending beyond it, and the appropriate time at which to activate any given provision when considered in the overall flow of planning and activities for and by the Enterprise. The importance of certain preparatory measures loom larger, namely, those concerning the development of Enterprise manpower resources and the connection between that requirement, the training obligation of the pioneer investor and the overall organizational and operational planning activities of the Special Commission.

67. The first chart in annex I of this paper depicts a general sequence of planning and development to the start-up of commercial operations, which is derived from the sequence (spanning approximately 22 years) used by experts in modelling ocean mining ventures. It has been adjusted for the Enterprise by extracting the stages and time periods for general prospecting and technology development. It assumes that there will be an uninterrupted flow of manpower and financial resources into the Enterprise, that commercial operations will be economically and technically feasible, and that the technology and/or components thereof will be readily available and can be configured into a suitable system. It will be noted

from the discussions under both the first and second sections of this paper that anticipated time periods, e.g. the two years for establishment of the Enterprise, are reflected in this flow chart.

68. The second chart in annex I demonstrates a possible method for facilitating the start-up of the Enterprise and for making use of the special provisions of paragraph 12 of resolution II. It indicates the special planning period identified, namely the year preceding the beginning of the first session of the Assembly and the way in which a "dedicated group of experts" would begin to work on Enterprise affairs, and how, from this group, at least the top managers would be subsequently identified and absorbed into the Enterprise. It may be noted that the second chart is essentially a modification of the base case presented in chart 1, depicting the same logical progression of activities, but advancing the planning sequence further into the preparatory period. To the extent possible, this is done without promoting movement from an interim and a provisional system into the definitive and permanent one. The actual phasing and timing of the measures that are suggested in chart 2 (both by the Preparatory Commission and the Enterprise) would depend on the pace at which ocean mining activities develop.

69. The approach suggested is one essentially of combining the development of managerial capability with the development of organizational and operational planning:

(a) Establish a mechanism for monitoring levels of activities and trends in:

(i) Pioneer activities (from periodic reports of certifying States);

(ii) Marine technology applicable to sea-bed mining (technology information bank);

(iii) Other developments relevant to establishing the feasibility of sea-bed mining;

(b) Draw up a working outline of a start-up establishment as suggested in paragraph 6 above, with desirable qualifications and experience indicated for each of the functions envisaged. Consideration might be given to encompassing the requirements of the members of the Governing Board, the Director-General, as well as the staff of the Enterprise in this exercise;

(c) Establish a mechanism for tripartite consultations (pioneer investors/certifying States/Commission) on programme development and implementation. Consultations could, for example:

(i) Identify the most desirable qualifications and experience for the Enterprise and instances where special training may be needed to ensure optimum performance of the functions required and determine what can be accomplished in the preparatory period;

(ii) Determine which training needs would be more reliably and efficiently achieved through direct practical experience, and which through group courses and specialized seminars (organized by pioneer investors and certifying States);

/...

(iii) Determine "transitional" training needs requiring pioneer investor and certifying State co-operation, for the organizational period following establishment of the date of entry into force of the Convention and continuing possibly through the first six months after that date. A linkage could be made to the provision on the training obligations of contractors (annex III, art. 15);

This same consultative mechanism would be employed for placement, timing and duration of training; technology assessment; mine-site evaluation and project development;

(d) Establish a list or roster derived from an outline start-up establishment, and the recommendations of consultations, from which personnel would be made available to serve as expert advisers, members of a "dedicated group":

(i) The Secretary-General, in consultation with Governments, could draw up a list of proposed advisers from which the desired number would be selected, numbers being subject to adjustment as required and taking into account the managerial needs of the Enterprise (and perhaps also of the Commissions of the Authority, who require similar expertise);

(ii) Advisers would be required to participate additionally in such work as Special Commission 2 considers advisable, e.g. to prepare detailed feasibility studies;

(iii) Subject to consultations with pioneer investors and certifying States, some advisers might spend specified periods participating in pioneer activities at an appropriate time. In addition, in the event that exploration of a reserved area is requested, advisers would be closely involved in the arrangement and in the development of operational planning in that context;

(iv) The "dedicated group of experts" would themselves help determine the ways in which the development of human resources could be pursued through training, whether in the context of activities in pioneer areas or of exploration in reserved areas, or through special training components devised to ensure final adaptation to Enterprise needs (e.g. modular courses, crash courses);

(v) In the year prior to entry into force, some members of the "dedicated group" would be designated as key Enterprise staff and temporarily recruited by the United Nations for that purpose;

(e) The Commission would have to consider questions of:

(i) Selection and utilization of expert advisers;

(ii) Evaluation and maintenance of records on personnel;

(iii) Designation as temporary recruits for the Enterprise;

(iv) Draft special recruitment procedures for the Enterprise to expedite its absorption of available designated personnel and others.

70. Since one of the main purposes to be served in such an approach to the development of managerial capability and operational planning for the Enterprise is the production of detailed feasibility reports on a cost-effective basis, it will be necessary for members of the "dedicated group" to work with in-house experts (United Nations) or outside consultants, on a task-by-task basis.

71. As indicated earlier, at least in the year prior to entry into force when temporary recruitment is proposed, costs could be incurred on a reimbursable basis (see para. 18). This approach is already used in paragraph 12 (a) (i) of resolution II in order to make it possible to undertake exploratory work in the interim period. Prior to that final year, the same approach for meeting the administrative expenses of the "dedicated group" (e.g. travel and per diem) could be used or be combined with supplementary requests to the General Assembly for special servicing of the Preparatory Commission.

72. In general, the establishment and development of a "dedicated group of experts" would serve a number of purposes:

(a) Expedite performance of much of the detailed planning work to be done for the Enterprise;

(b) Provide the means by which the Preparatory Commission passes important knowledge and experience to the Enterprise, along with its body of documentation;

(c) Help ensure that the managerial needs of the Enterprise can be met without delays, ensuring also that the Enterprise will be capable of:

(i) Implementing the immediate actions that may be required of it;

(ii) Expanding rapidly if circumstances so warrant;

(iii) Moving smoothly into whatever organizational form it will ultimately take, depending on the kinds of operational options that are implemented;

(d) Facilitate the development of the interorganizational skills needed (Director-General and staff/Governing Board/Council), in addition to the skills normally required for running a commercial enterprise.

Annex I

FLOW CHARTS DEPICTING METHODS OF ADVANCE PLANNING

Chart 1. General sequence of project development (base case)

Chart 2. Summary of a possible approach to facilitating start-up

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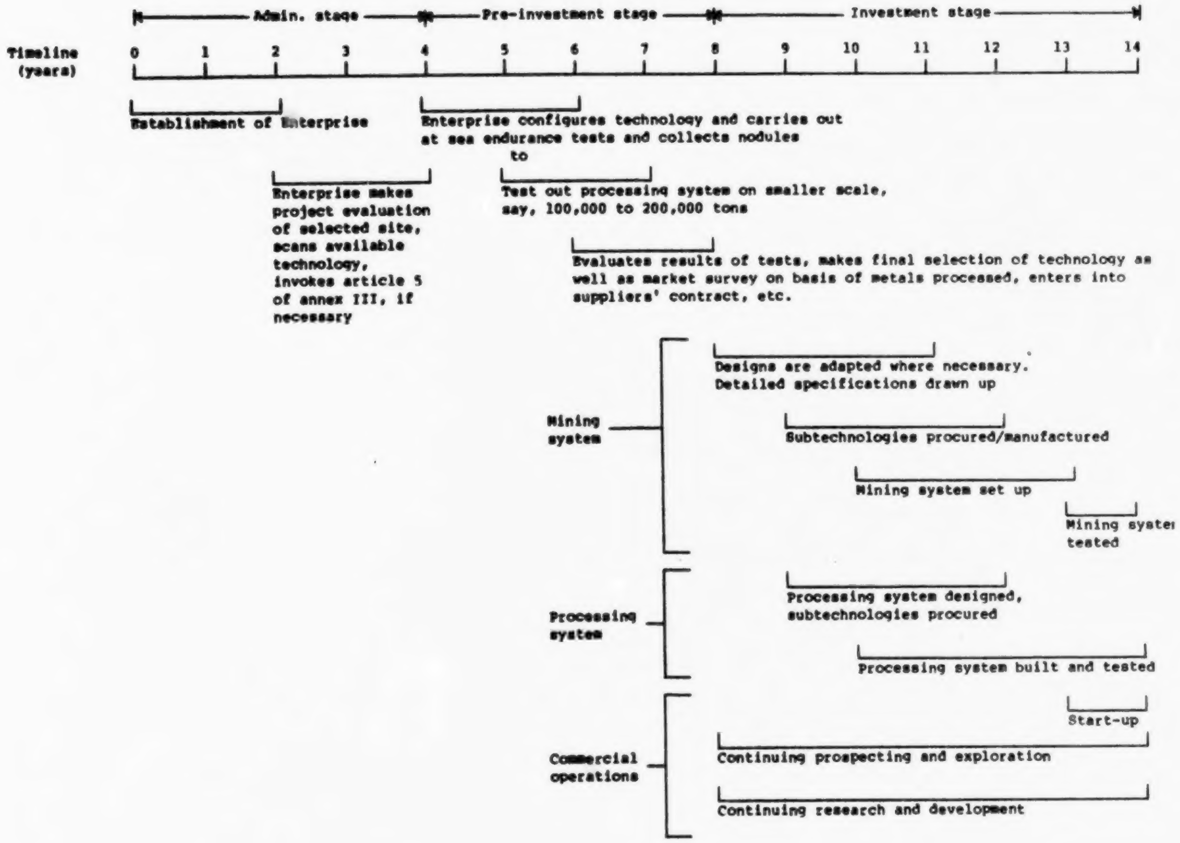
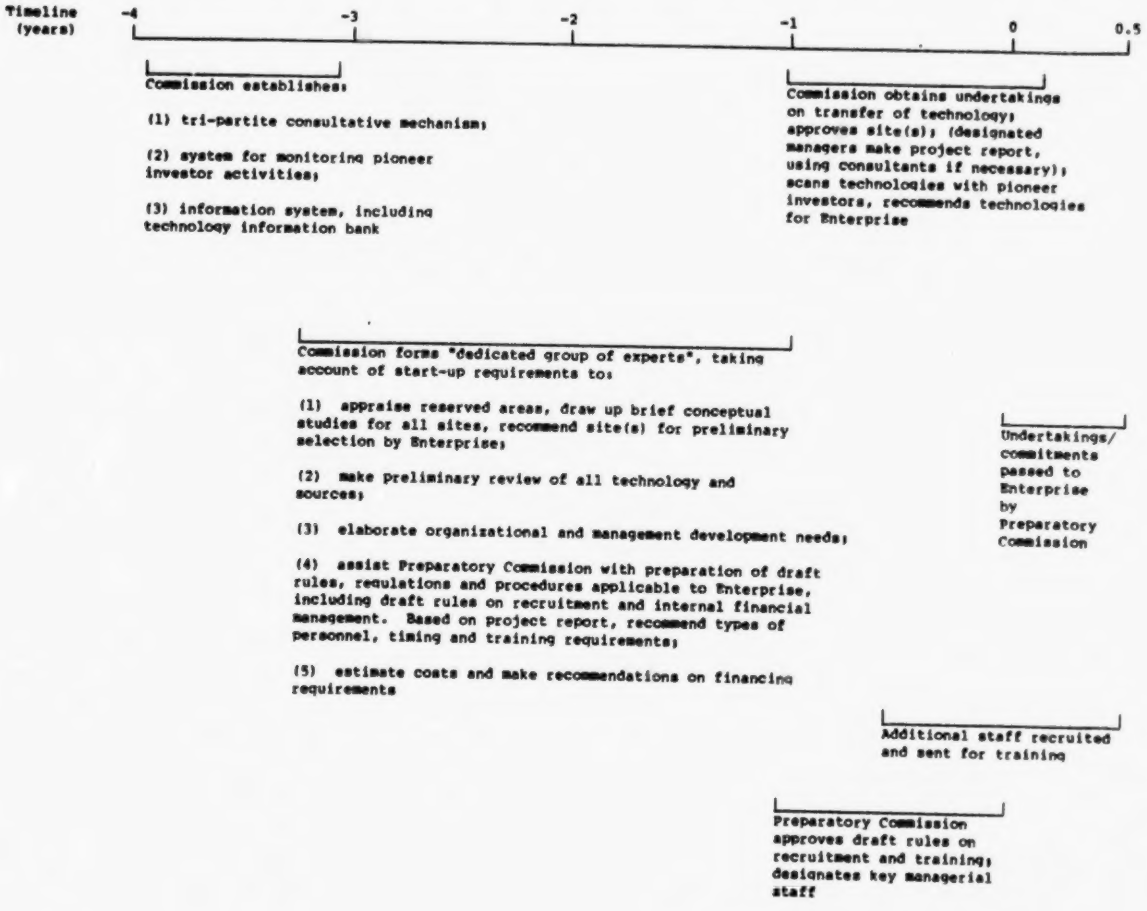
Chart 1. General sequence of project development (base case)


Admin. stage
Pre-investment stage
Investment stage
Timeline (years)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Establishment of Enterprise
Enterprise configures technology and carries out at sea endurance tests and collects nodules
to
Enterprise makes project evaluation of selected site, scans available technology, invokes article 5 of annex III, if necessary
Test out processing system on smaller scale, say, 100,000 to 200,000 tons
Evaluates results of tests, makes final selection of technology as well as market survey on basis of metals processed, enters into suppliers' contract, etc.
Mining system
Designs are adapted where necessary. Detailed specifications drawn up
Subtechnologies procured/manufactured
Mining system set up
Mining syste tested
Processing system
Processing system designed, subtechnologies procured
Processing system built and tested
Commercial operations
Start-up
Continuing prospecting and exploration
Continuing research and development

Source: This chart is adapted from A Pioneer Deep Ocean Mining Venture. By Wyhart, J. D. and others. Cambridge, Massachusettes Institute of Technology, MITSG 83-14, 1984.

Note. This chart represents a total mining project, whether conducted through a joint venture or by contracting.

Chart 2. Summary of a possible approach to facilitating start-up



Commission establishes:

(1) tri-partite consultative mechanism;

(2) system for monitoring pioneer investor activities;

(3) information system, including technology information bank

Commission obtains undertakings on transfer of technology; approves site(s); (designated managers make project report, using consultants if necessary); scans technologies with pioneer investors, recommends technologies for Enterprise

Commission forms "dedicated group of experts", taking account of start-up requirements to:

(1) appraise reserved areas, draw up brief conceptual studies for all sites, recommend site(s) for preliminary selection by Enterprise;

(2) make preliminary review of all technology and sources;

(3) elaborate organizational and management development needs;

(4) assist Preparatory Commission with preparation of draft rules, regulations and procedures applicable to Enterprise, including draft rules on recruitment and internal financial management. Based on project report, recommend types of personnel, timing and training requirements;

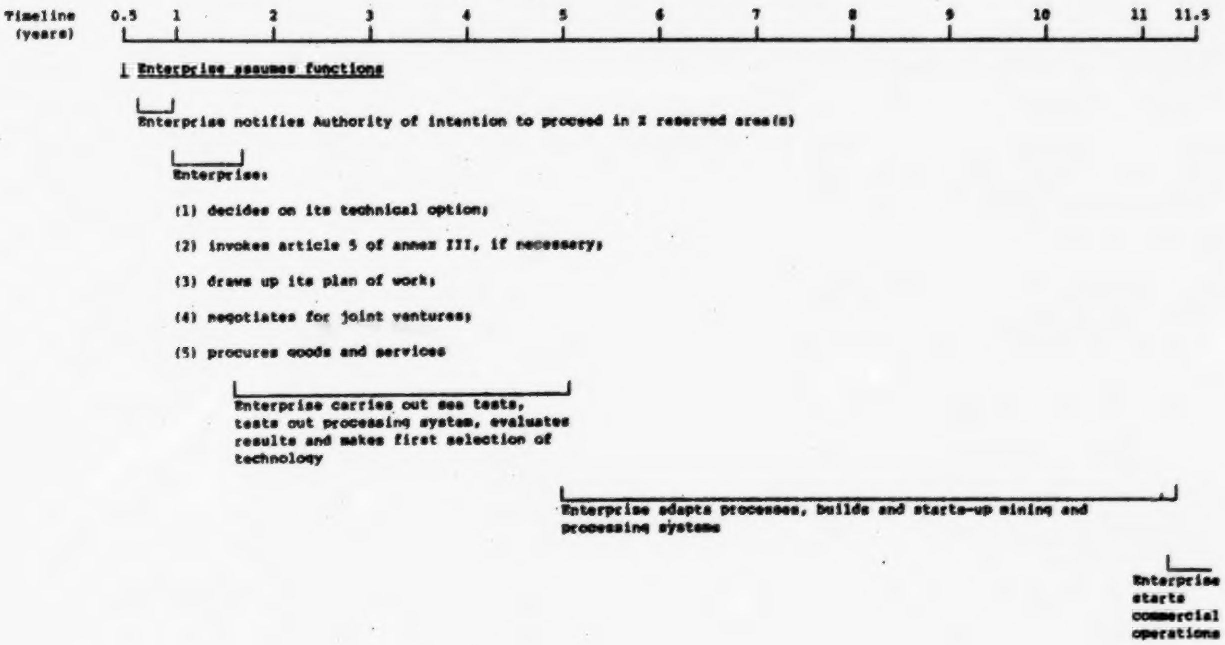
(5) estimate costs and make recommendations on financing requirements

Undertakings/ commitments passed to Enterprise by Preparatory Commission

Additional staff recruited and sent for training

Preparatory Commission approves draft rules on recruitment and training; designates key managerial staff

Chart 2. Summary of a possible approach to facilitating start-up (continued)



Enterprise assumes functions

Enterprise notifies Authority of intention to proceed in X reserved area(s)

Enterprise:

(1) decides on its technical option;

(2) invokes article 5 of annex III, if necessary;

(3) draws up its plan of work;

(4) negotiates for joint ventures;

(5) procures goods and services

Enterprise carries out sea tests, tests out processing system, evaluates results and makes first selection of technology

Enterprise adapts processes, builds and starts-up mining and processing systems

Enterprise starts commercial operations

/...

Annex II

ALTERNATIVE APPROACHES TO THE ACQUISITION OF TECHNOLOGICAL CAPABILITY

1. The goals and strategies for acquiring, adapting and modifying technology will be one of the most important decisions to be made by the Enterprise, both for its operational capabilities and the scale and timing of its financial and manpower requirements.

2. There are various levels of technological capability, the minimum being the ability to acquire a system and the skills to operate it, and the most advanced being the ability to independently develop and operate complex systems.

3. The approaches available to the Enterprise may be distinguished as follows:

(a) Scrutinize the different technologies likely to be employed by the pioneer investors, select out of these technologies the one likely to be most cost-effective for the area(s) chosen for exploitation, and thereafter arrange for its acquisition;

(b) Engage a systems contractor at the outset and provide for technology acquisition through the setting up of a counterpart in-house group;

(c) Carry out a conceptual design and engineering analysis (including model tests) and thereafter select the pioneer investor or systems contractor;

(d) Act as its own systems contractor and thereafter choose the major subsystem contractors to implement the details of the acquisition process.

4. Figure 1 below shows the approximate stage at which a chosen strategy would be put into effect.

5. Under all approaches, the Enterprise would have to have its own complement of key technical and managerial staff. The technical staff would perform a preliminary review of the technology, perform brief conceptual design and feasibility studies, review and qualify available sources of technology, and define and implement decision processes so as to enable the Enterprise to acquire an ongoing deep-sea mining operational capability. The managerial staff would examine the project from the point of view of financial viability, scan the external environment and build up the appropriate institutional infrastructure. A redundant capability would also have to be built into the staff component, to take account of attrition.

6. Under the first approach there would be fewer risks. While it is difficult to estimate what the acquisition cost of a pioneer investor's technology would be, it can be assumed that it would be somewhat lower than the cost the Enterprise would incur in developing its own technology. However, this approach would not make a contribution to the development of the expertise needed to adapt and modify the acquired system nor would it further the development of an independent technology development capability. A general estimate of the inflow of staff and finance required under this approach is given in tables 1A and 1B.

/...

7. Under the second approach, if a good systems contractor is available the probabilities of achieving an economically operational system would be very similar to those under the first approach, although consequences for the development of expertise would be somewhat improved. The inflow of staff and finance is depicted in tables 2A and 2B.

8. The third approach would seem to improve the ability of the Enterprise to make an effective choice of pioneer investor or systems contractor. In one variant, the first approach is refined and in the other the second approach is modified. Tables 3A and 3B indicate that expenditures would not be significantly higher than in the first and second approaches. It should be noted that the extra costs arising under staff requirements (table 3B) would appear as decreases in the budget of the pioneer investor or systems contractor. Programme risks are lower than in the earlier approaches because the enhanced capability of the Enterprise leads to better interfacing with the pioneer investor/systems contractor, and thus to higher programme performance. The number of knowledgeable persons available to the Enterprise is also increased.

9. The variants depicted under the third approach may call for particular attention. The choice between the two would depend primarily on what the pioneer investor charges for the transfer of its technology, the number of people that can be effectively trained by the pioneer investor, and the qualifications of the systems contractor. The basic trade-off may become that of assuming the risk involved in engaging the systems contractor in return for some assurances as to the ability to attain an earlier independent system design capability.

10. The requirements for the fourth approach are given in tables 4A and 4B. The risk in this approach is that there would be no absolute guarantee of producing an efficient system.

11. For the purpose of seeking to further refine the manpower and financial start-up requirements of the Enterprise in its initial period (five years), it may be noted that no major change occurs in the quantitative sense although the Preparatory Commission would need to consider making adjustments in the kind of human resource development which it contemplated and in the way in which it categorized the financial requirements of the Enterprise.

12. The estimated manpower requirements and staff costs (in 1979 $US) indicated in the four sets of tables are based on figures given in a report entitled "Alternatives for technology transfer to the Enterprise", by Science Applications Inc. for the U.S. Bureau of Mines (report No. SAI-460-80-401LJ). They may vary from -40 per cent to +100 per cent and can be taken as indicative of orders of magnitude only.

Figure 1. Summary of the four alternative approaches to technology acquisition

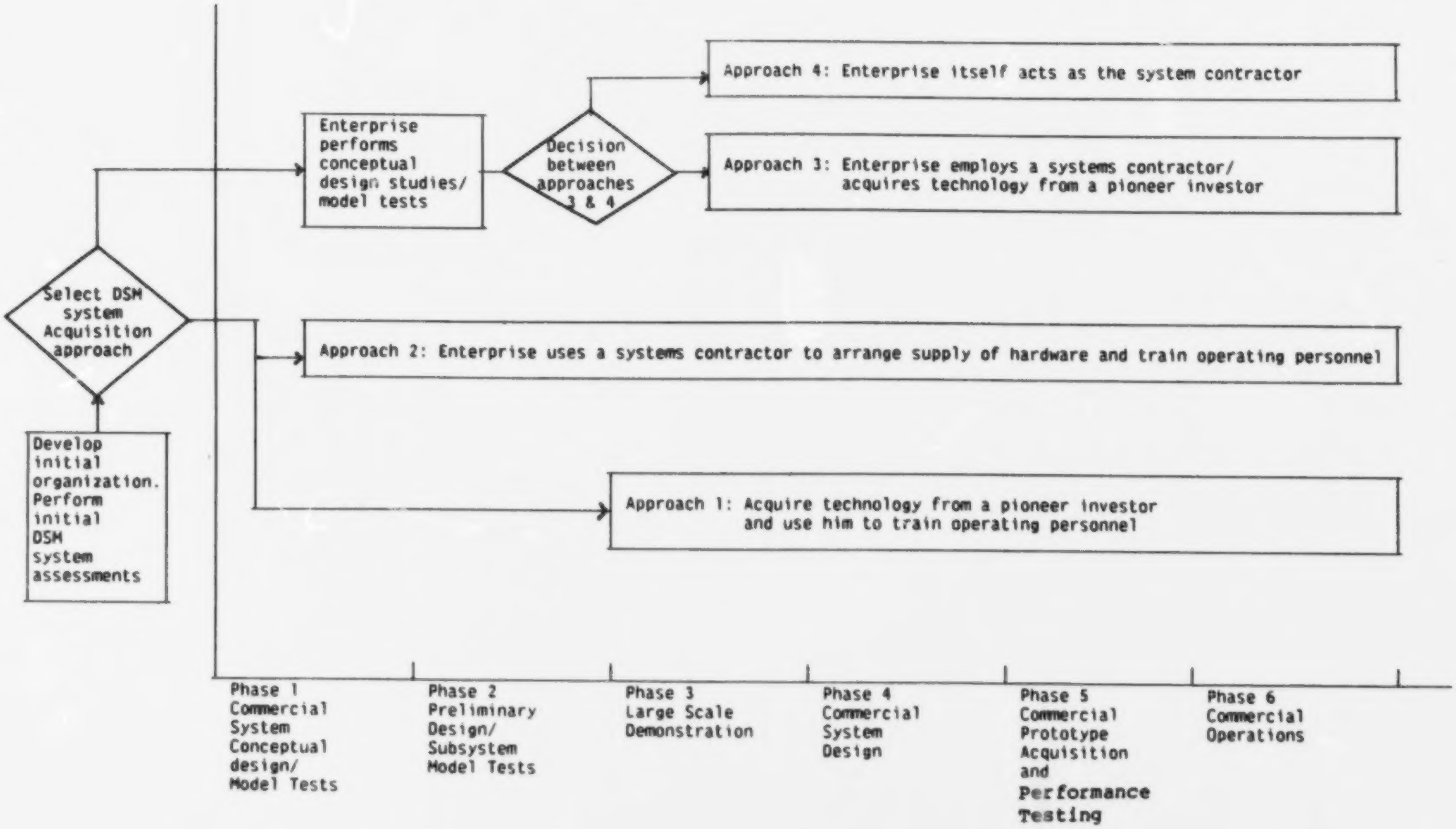

Select DSM system Acquisition approach
Develop initial organization. Perform initial DSM system assessments
Enterprise performs conceptual design studies/ model tests
Decision between approaches 3 & 4
Approach 4: Enterprise itself acts as the system contractor
Approach 3: Enterprise employs a systems contractor/ acquires technology from a pioneer investor
Approach 2: Enterprise uses a systems contractor to arrange supply of hardware and train operating personnel
Approach 1: Acquire technology from a pioneer investor and use him to train operating personnel
Phase 1 Commercial System Conceptual design/ Model Tests
Phase 2 Preliminary Design/ Subsystem Model Tests
Phase 3 Large Scale Demonstration
Phase 4 Commercial System Design
Phase 5 Commercial Prototype Acquisition and Performance Testing
Phase 6 Commercial Operations

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Table 1A. Estimated manpower requirements of technology approach 1

Category of manpower	Numbers of personnel					
	Programme phase					
	1	2	3	4	5	6
1. Senior administrative staff/ economic analysts	2 + 1 a/	2 + 1 a/	2 + 1 a/	4	4	4
2. Procurement staff	-	-	-	4	6	3
3. Legal staff	1	1	1	3	4	4
4. Engineering staff (mining)						
4.1 Key staff	10	10	10	20	20	20
4.2 Trainees	-	-	-	20	20	20
5. Engineering staff (processing)						
5.1 Key staff	10	10	10	20	20	20
5.2 Trainees	-	-	-	20	20	20
6. Scientific staff						
6.1 Key scientists	4	4	4	4	4	4
6.2 Trainees	-	-	-	5	5	5
7. Support staff	8	8	8	14	23	23
8. Operational personnel						
8.1 Mining system	-	-	-	-	55	110
8.2 Prospecting/exploration	-	-	-	21	21	21
Total estimated manpower	36	36	36	135	202	254

a/ Engineering manager.

/...

Table 1B. Estimated staff costs of technology approach 1

		Programme phase											
Item		1		2		3		4		5		6	
Estimated duration (years)		1		1		1.5		1.5		2		2	
Manpower category	$ rate 000s	Man-years	Cost	Man-years	Cost	Man-years	Cost	Man-years	Cost	Man-years	Cost	Man-years	Cost
1. Administrative/ economic analysts	100	3	.30	3	.30	4.5	.45	6	.60	8	.80	8	.80
2. Procurement staff	80	-	-	-	-	-	-	6	.48	12	.96	6	.48
3. Legal staff	100	1	.10	1	.10	1.5	.15	4.5	.45	8	.80	8	.80
4. Engineering staff (mining)													
4.1 Key staff	80	10	.80	10	.80	15	1.20	30	2.40	40	3.20	40	3.20
4.2 Trainees	40	-	-	-	-	-	-	30	1.20	40	1.60	40	1.60
5. Engineering staff (processing)													
5.1 Key staff	80	10	.80	10	.80	15	1.20	30	2.40	40	3.20	40	3.20
5.2 Trainees	40	-	-	-	-	-	-	30	1.20	40	1.60	40	1.60
6. Scientific staff													
6.1 Key scientists	80	4	.32	4	.32	6	.48	6	.48	8	.64	8	.64
6.2 Trainees	40	-	-	-	-	-	-	7.5	.30	10	.40	10	.40
7. Support staff	40	8	.32	8	.32	12	.48	21	.84	46	1.84	46	1.84
8. Operational personnel													
8.1 Mining system	40	-	-	-	-	-	-	-	-	110	4.40	220	8.80
8.2 Prospecting/exploration	40	-	-	-	-	-	-	31.5	1.26	42	1.68	42	1.68
Total ($ million)			2.64		2.64		2.64		11.61		21.12		25.04
Cumulative total ($ million)			2.64		5.28		7.92		19.53		40.65		65.79

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Table 2A. Estimated manpower requirements of technology approach 2

Category of manpower	Numbers of personnel					
	Programme phase					
	1	2	3	4	5	6
1. Senior administrative staff/ economic analysts	4	4	4	4	4	4
2. Procurement staff	3	3	4	4	6	3
3. Legal staff	1	2	3	3	4	4
4. Engineering staff (mining)						
4.1 Key staff	20	20	20	20	20	20
4.2 Trainees	10	10	20	20	20	20
5. Engineering staff (processing)						
5.1 Key staff	20	20	20	20	20	20
5.2 Trainees	10	10	20	20	20	20
6. Scientific staff						
6.1 Key scientists	4	4	4	4	4	4
6.2 Trainees	5	5	5	5	5	5
7. Support staff	12	14	18	14	23	23
8. Operational personnel						
8.1 Mining system	-	-	-	-	55	110
8.2 Prospecting/Exploration	-	-	-	21	21	21
Total estimated manpower	89	92	118	135	202	254

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Table 28. Estimated staff costs of technology approach 2

		Programme phase											
Item		1		2		3		4		5		6	
Estimated duration (years)		1		1		1.5		1.5		2		2	
Manpower category	$ rate 000s	Man-years	Cost	Man-years	Cost	Man-years	Cost	Man-years	Cost	Man-years	Cost	Man-years	Cost
1. Administrative/ economic analysts	100	4	.40	4	.40	6	.60	6	.60	8	.80	8	.80
2. Procurement staff	80	3	.24	3	.24	6	.48	6	.48	12	.96	6	.48
3. Legal staff	100	1	.10	2	.20	4.5	.45	4.5	.45	8	.80	8	.80
4. Engineering staff (mining)													
4.1 Key staff	80	20	1.60	20	1.60	30	2.40	30	2.40	40	3.20	40	3.20
4.2 Trainees	40	10	.40	10	.40	30	1.20	30	1.20	40	1.60	40	1.60
5. Engineering staff (processing)													
5.1 Key staff	80	20	1.60	20	1.60	30	2.40	30	2.40	40	3.20	40	3.20
5.2 Trainees	40	10	.40	10	.40	30	1.20	30	1.20	40	1.60	40	1.60
6. Scientific staff													
6.1 Key scientists	80	4	.32	4	.32	6	.48	6	.48	8	.64	8	.64
6.2 Trainees	40	5	.20	5	.20	7.5	.30	7.5	.30	10	.40	10	.40
7. Support staff	40	12	.48	14	.56	27	1.08	21	.84	46	1.84	46	1.84
8. Operational personnel													
8.1 Mining system	40	-	-	-	-	-	-	-	-	110	4.40	220	8.80
8.2 Prospecting/exploration	40	-	-	-	-	-	-	31.5	1.26	42	1.68	42	1.68
Total ($ million)			5.74		5.92		10.59		11.61		21.12		25.04
Cumulative total ($ million)			5.74		11.66		22.25		33.86		54.98		80.02

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Table 3A. Estimated manpower requirements of technology approach 3

Category of manpower	Numbers of personnel					
	Programme phase					
	1	2	3	4	5	6
1. Senior administrative staff/ economic analysts	4	4	4	4	4	4
2. Procurement staff	3	3	4	4	6	3
3. Legal staff	1	2	3	3	4	4
4. Engineering staff (mining)						
4.1 Key staff	24	27	27	27	27	27
4.2 Trainees	-	10	20	20	20	20
5. Engineering staff (processing)						
5.1 Key staff	24	27	27	27	27	27
5.2 Trainees	-	10	20	20	20	20
6. Scientific staff						
6.1 Key scientists	11	11	11	11	11	11
6.2 Trainees	-	15	15	15	15	15
7. Support staff	10	14	20	20	23	23
8. Operational personnel						
8.1 Mining system	-	-	-	-	55	110
8.2 Prospecting/exploration	-	-	-	21	21	21
Total estimated manpower	77	123	151	172	233	285

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Table 3B. Estimated staff costs of technology approach 3

		Programme phase											
Item		1		2		3		4		5		6	
Estimated duration (years)		1		1		1.5		1.5		2		2	
Manpower category	$ rate 000s	Man-years	Cost	Man-years	Cost	Man-years	Cost	Man-years	Cost	Man-years	Cost	Man-years	Cost
1. Administrative/ economic analysts	100	4	.40	4	.40	6	.60	6	.60	8	.80	8	.80
2. Procurement staff	80	3	.24	3	.24	6	.48	6	.48	12	.96	6	.48
3. Legal staff	100	1	.10	2	.20	4.5	.45	4.5	.45	8	.80	8	.80
4. Engineering staff (mining)													
4.1 Key staff	80	24	1.92	27	2.16	40.5	3.24	40.5	3.24	54	4.32	54	4.32
4.2 Trainees	40	-	-	10	.40	30	1.20	30	1.20	40	1.60	40	1.60
5. Engineering staff (processing)													
5.1 Key staff	80	24	1.92	27	2.16	40.5	3.24	40.5	3.24	54	4.32	54	4.32
5.2 Trainees	40	-	-	10	.40	30	1.20	30	1.20	40	1.60	40	1.60
6. Scientific staff													
6.1 Key scientists	80	11	.88	11	.88	16.5	1.32	16.5	1.32	22	1.76	22	1.76
6.2 Trainees	40	-	-	15	.60	22.5	.90	22.5	.90	30	1.20	30	1.20
7. Support staff	40	10	.40	14	.56	30	1.20	30	1.20	46	1.84	46	1.84
8. Operational personnel													
8.1 Mining system	40	-	-	-	-	-	-	-	-	110	4.40	220	8.80
8.2 Prospecting/exploration	40	-	-	-	-	-	-	31.5	1.26	42	1.68	42	1.68
Total ($ million)			5.86		8.0		13.83		15.09		25.28		29.20
Cumulative total ($ million)			5.86		13.86		27.69		42.78		68.06		97.26

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Table 4A. Estimated manpower requirements of technology approach 4

	Numbers of personnel					
	Programme phase					
Category of manpower	1	2	3	4	5	6
1. Senior administrative staff/ economic analysts	4	6	6	6	6	5
2. Procurement staff	3	3	4	6	6	3
3. Legal staff	1	2	2	4	4	2
4. Engineering staff (mining)						
4.1 Key staff	27	27	27	27	27	27
		13 a/	13 a/	25 a/	15 a/	15 a/
4.2 Trainees	20	20	20	20	20	20
5. Engineering staff (processing)						
5.1 Key staff	27	27	27	27	27	27
		13 a/	13 a/	25 a/	15 a/	15 a/
5.2 Trainees	20	20	20	20	20	20
6. Scientific staff						
6.1 Key scientists	11	11	11	11	11	11
6.2 Trainees	15	15	15	15	15	15
7. Support staff	20	24	28	33	33	20
8. Operational personnel						
8.1 Mining system	-	-	-	110	-	70
8.2 Prospecting/exploration	-	-	-	20	20	20
Total estimated manpower	148	180	186	337	219	271

a/ Engineering support staff.

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Table 4B. Estimated staff costs of technology approach 4

Item		Programme phase 1		2		3		4		5		6	
Estimated duration (years)		1		1		1.5		1.5		2		2	
Manpower category	$ rate 000s	Man-years	Cost	Man-years	Cost	Man-years	Cost	Man-years	Cost	Man-years	Cost	Man-years	Cost
1. Administrative/ economic analysts	100	4	.40	6	.60	9	.90	9	.90	12	1.20	10	1.00
2. Procurement staff	80	3	.24	3	.24	6	.48	9	.72	12	.96	6	.48
3. Legal staff	100	1	.10	2	.20	3	.30	6	.60	8	.80	4	.40
4. Engineering staff (mining)													
4.1 Key staff	80	27	2.16	27	2.16	40.5	3.24	40.5	3.24	54	4.32	54	4.32
4.2 Trainees	40	20	.80	33 a/	1.32	49.5 a/	1.98	67.5 a/	2.70	70 a/	2.80	70 a/	2.80
5. Engineering staff (processing)													
5.1 Key staff	80	27	2.16	27	2.16	40.5	3.24	40.5	3.24	54	4.32	54	4.32
5.2 Trainees	40	20	.80	33 a/	1.32	49.5 a/	1.98	67.5 a/	2.70	70 a/	2.80	70 a/	2.80
6. Scientific staff													
6.1 Key scientists	80	11	.88	11	.88	16.5	1.32	16.5	1.32	22	1.76	22	1.76
6.2 Trainees	40	15	.60	15	.60	22.5	.90	22.5	.90	30	1.20	30	1.20
7. Support staff	40	20	.80	24	.96	42	1.68	49.5	1.98	66	2.64	40	1.60
8. Operational personnel													
8.1 Mining system	40	-	-	-	-	-		165	6.60	-	-	140	5.60
8.2 Prospecting/exploration	40	-	-	-	-	-		30	1.20	40	1.60	40	1.60
Total ($ million)			8.94		10.44		16.02		26.10		24.40		27.88
Cumulative total ($ million)			8.94		19.38		35.40		61.50		85.90		113.78

a/ Includes support staff who receive same salary as trainees.

Annex III

HISTORICAL NOTE ON PROVISIONS OF PARAGRAPH 12

Banking system

1. At the time of the negotiation and drafting of resolution II there was disagreement over the correlation between the number of banked sites and early entry into effective operation of the Enterprise. It was successfully argued that it would be unsuitable to impose the obligation to present a site for the Enterprise on some and not on all pioneer investors. One proposal that was made to circumvent that problem was to require all pioneer investors and certifying States to co-operate in supplying an area or areas for the Enterprise (TPIC/2, para. 4 (b)). The position prevailed that the banking system would be strictly applied on a one-to-one basis (A/CONF.62/C.1/L.30, para. 23) and that the obligations entailed would be imposed on each individual pioneer investor.

2. Disagreements over the application of the parallel system during the interim régime were linked to similar disagreements with the provisions of the Convention on the banking method: "random selection" was proposed as the method to be used (by the Legal and Technical Commission) in the event of a failure by the Enterprise and the pioneer investor to agree on the allocation of areas. (WG/21, informal paper 18 re annex III, art. 8.)

Distribution of obligations

3. During the negotiations and drafting of resolution II, various distributions of the obligations as between pioneer investors and certifying States were proposed, e.g. certifying States would arrange for the provision of an area or areas for the Enterprise together with sufficient data and each would be prepared to perform the obligations on transfer of technology; certifying States as appropriate in co-operation with any pioneer investor would carry out exploration (A/CONF.62/L.122); certifying States would ensure that operators provided training opportunities for personnel from developing States (TPIC/2, para. 3 (b)).

Exploration and training

4. The question of training prior to entry into force to meet the needs of the Enterprise was long a concern of the Conference on the Law of the Sea. Its First Committee in 1979 requested a study of the Secretariat on manpower requirements of the Enterprise (A/CONF.62/82). In the process of drafting resolution II some attention was paid to the ways in which training could be accomplished. As referenced in paragraph 3 above, one proposal was that the pioneer investors obligations would flow from annex III, article 15, i.e. practical programmes for the training of personnel from developing States including participation of such personnel in activities (covered by a contract). The proposal in document TPIC/2 (para. 3 (b)) provided that the pioneer investors would be adequately compensated. Particular attention was paid to a proposal in document TPIC/4 whereby the pioneer investors would inform the Preparatory Commission of their technical qualifications

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and the number of persons assigned to their projects, on the basis of which information the Preparatory Commission would determine the staffing requirements of the Enterprise and "begin recruiting" staff, who would then be apportioned amongst the pioneer investors on a equal-cost basis. The pioneer investors would have to undertake to involve such personnel in the development of each of the components of their projects and to arrange for the participation of staff specialized in exploration work in the exploration of the reserved area. That proposal would have had the pioneer investors share the obligation to explore a site for the Enterprise on entry into force, with a view to immediate exploitation of that site; it further provided that no pioneer investor could start exploitation before exploration of the Enterprise site was completed. At the time, the Co-ordinators of First Committee negotiations noted that TPIC/4 would provide the Preparatory Commission with a very valuable model of what could be done in this field (see A/CONF.62/C.1/L.30, para. 29).

Transfer of technology

5. This provision in paragraph 12, resolution II, had been variously drafted during the negtotiations. The main difference from the final provision can be found in annex II of document A/CONF.62/C.1/L.30, documents TPIC/3 and A/CONF.62/L.94, where the emphasis was on being prepared to perform the obligations, or, as in document A/CONF.62/L.116, on actually performing the obligations entailed prior to entry into force. As noted in paragraph 3 above, one proposal required that the obligation be shared between certifying States and pioneer investors.

Funds

6. Under several of the proposals of the eleventh session of the Conference on the Law of the Sea (TPIC/3 and A/CONF.62/L.94), it was the pioneer investor who would ensure that the necessary funds were available. Furthermore, an early formulation in annex II of document A/CONF.62/C.1/L.30 also placed the obligation with the pioneer investor.

Periodic reporting

7. The only other proposal made with respect to this obligation can be found in document TPIC/2, whereby certifying States would make an annual report on the measures taken to make an area or areas available to the Enterprise (of equivalent size and comparable value), with sufficient data so that the Enterprise could commence activities in the same time frame as operators, and on their obligation to be prepared to perform the Convention's obligations relating to transfer of technology.

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LOS/PCN/SCN.2/WP.3
21 August 1984

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2

INFORMATION NOTE ON ELEMENTS OF JOINT VENTURES

Background paper by the Secretariat

This background paper on joint venture arrangements was prepared by the Secretariat in response to a request made by the Special Commission on the Enterprise at the last session in Kingston, Jamaica. This paper broadly outlines considerations relevant to the conclusion of joint ventures.

The paper deals with the main elements of joint ventures, stressing the fact of their flexibility and the consequent need for careful negotation. Following a general discussion of the scope of joint ventures, Section A deals briefly with the questions of juridical personality and governing law. Section B treats the question of the nature of joint venture arrangements and the means for distinguishing between the two main classifications thereof. Section C and D of the paper outline issues central to the capitalization and management of joint venture, and Section E briefly covers financial policy questions. The final section of the paper raises issues relevant to liability and the settlement of disputes. Throughout the paper, where there may be considerations particularly pertinent to joint venture arrangements with the Enterprise, that fact has been noted.

Introduction

1. An almost infinite variety of forms of participation in international investment exists, reflecting the spectrum of economic and legal systems and differing investment priorities. Experience over the last decades indicates an increasing tendency to tailor arrangements to suit the peculiarities of a specific venture and to meet the objectives of any particular investment project. By far the most popular and useful sort of investment arrangement is the joint venture, due to its flexibility: a very wide range of combinations of terms and conditions within a joint venture relationship is possible. Such terms and conditions include issues of ownership; capital structure; control; direction and management; financial policies; questions of industrial property, technical assistance and know-how; marketing; relationships among the partners; and settlement of disputes. The choice of any particular form of arrangement will have different implications regarding decison-making, risk and benefit sharing, the central issues for negotiation. The Convention on the Law of the Sea itself provides for joint ventures or joint arrangements in several articles, including Annex III, articles 5(6), 9, 11 and 13, and Annex IV, article 6(g). Should the Enterprise choose to avail itself of this option, a very broad array of possible relationships into which it may enter is presented.

2. Due to the flexibility of joint venture arrangements and the spectrum of options which exists, it is often difficult to classify what technically falls into the category of joint venture and what does not. Joint ventures are merely business arrangements of varying complexities, generally between two partners although it is not uncommon for more than two partners to be involved. The more partners involved, the more cumbersome the negotiation process may become, however the underlying considerations would remain the same.

3. All of the issues concerning the joint venture project will be the subject of negotiation between the parties, the results being incorporated into the joint venture agreement. Often certain particulars will be dictated by the legal position of one or both of the parties. It can be envisioned that this will be especially true where one of the partners is the Enterprise. That is, the fact that the Enterprise is an international public enterprise in the traditional sense will no doubt be a significant factor in determining the kind of joint venture arrangement appropriate under the circumstances.

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4. The related question of the relative bargaining powers of the parties is often raised in the literature, the underlying assumption being that a developing country partner is often at a disadvantage. This wisdom need not prevail, however, in the case of joint ventures with the Enterprise. The Enterprise may enter into arrangements with either developed or developing countries (or both) in any particular case. Traditional notions of foreign investor/developing host State positions will not necessarily hold true, therefore, due to the international character of the Enterprise. Furthermore, since the underlying policies and regulations governing the Enterprise are or have been promulgated through a multilateral forum, its bargaining power may be subject to influence by varying priority interests. In any event, it is difficult to define in a general way what the priorities of any particular negotiation would be, especially taking into account the varying scope of possible projects to be undertaken, and it is not unlikely that the final joint venture agreement will represent a "package" including questions of jurisdiction, governing law, duration, ownership, control, financial policies and technical aspects. The strengths and weaknesses of either party to the negotiation would vary according to the particular circumstances and in any case are not likely to follow traditional patterns. The Enterprise may take best advantage of the joint venture option within the system of exploration and exploitation established under the Convention if it has available to it a team of able and well-informed negotiators to act on its behalf in the negotiation stages of any joint venture agreement.

A. Juridical personality and governing law

5. The juridical personality of a joint venture would vary in accordance with the particular type of arrangement entered into. however as a rule it would be derived from national law. The requirements of the particular jurisdiction may dictate the kinds of arrangements feasible, which jurisdiction would likely be an early subject of negotiation. The question of governing law may follow from whatever decision is made regarding jurisdiction, and may therefore be an element of such negotiation. However, the parties may be free to select other governing law as among themselves.

6. The international nature of the site and resources in a sea-bed mining venture brings a further element into the picture. The Convention on the Law of the Sea and the rules, regulations and procedures of the Authority must govern, especially if national legislation is found to be incompatible or inconsistent therewith. This is true with respect to the law governing both the internal and external relations of the venture, and it is not inconceivable that the rules, regulations and procedures of the Authority may encompass questions regarding ownership and equity participation, duration of contracts, control and management, relinquishment, royalties, pricing and marketing, profits, training, financing, transfer of technology, settlement of disputes or other reservation of powers to the Enterprise and the Authority (see Annex III, article 9(3)).

B. Nature of the joint venture arrangements

7. All direct investment arrangements involve either an equity relationship or a contractual relationship (or some combination of the two). An equity relationship would entail the establishment by the partners of a new entity, ownership of which may lie either totally with one party (wholly-owned subsidiary) or be shared (equity joint venture). The degree of "inter-connectedness" of the parties to a contract, on the other hand, may vary, ranging from a contractual joint venture to a simple service or supply contract.

8. The two broad categories of joint ventures or joint arrangements being considered, then, are as follows:

(a) Equity joint ventures, where the partners enter into an company relationship, each supplying capital (equity) for the formation of a new entity. Ownership considerations such as capital structure, manner of contribution, valuation, control and distribution of profits and assets are all issues which must be resolved and which should be embodied in the agreement. Various forms of company relationships may be possible, ranging from simple partnership to incorporation. The law of the governing jurisdiction may play an important role regarding the kind of arrangement entered into, and questions of liability of the partners will no doubt be determinative in this respect. If the entity is to be incorporated, the articles of association may be more or less broad than the joint venture agreement itself, depending upon the requirements of the governing jurisdiction;

(b) Contractual joint ventures, which do not result in the formation of a new entity. Rather, they are contractual relationships entered into for the supply of capital, equipment, industrial property, technical assistance and know-how, services, licensing, royalties, marketing, etc.

9. In some cases it may be somewhat difficult to categorize definitively a relationship as a joint venture or a simple contractual arrangement. The literature sometimes distinguishes between contractual joint ventures and "special contractual arrangements" on the ground that the sharing of control, decision-making, risk and benefits is not proportionate to the respective contributions of the partners in the latter case. However, there is no requirement of proportionality in any joint venture arrangement, and that in fact is the basis of their flexibility and popularity. Furthermore, assuming the equality of bargaining power of the partners, it would be difficult to argue that the relationship is not a proportionate one, since all elements of the arrangement will be negotiated and hence valued by the partners themselves.

10. Because of the flexibility of joint ventures it may sometimes be difficult to determine the existence of a loosely formed equity arrangement, as opposed to a somewhat complex contractual one. Should this be the case, a useful basis for distinction between the two is to determine the nature of returns to the partners: if returns are in the form of profits on capital, the underlying relationship is an equity one; if returns are determined only by a negotiation of fair return on contribution and risk, the relationship is a contractual one. As between different kinds of contractual arrangements, one might look to the degree and nature of involvement of the parties. That is, one must look to the elements themselves to determine the "jointness" of the arrangement.

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11. In recent years the number of agreements establishing contractual joint ventures has grown considerably. The advantage of this type of arrangement is that it generally gives the parties greater leeway with regard to the terms and conditions of the contract. Since this contractual arrangement does not require the formation of a new juridical person, the contractual joint venture is not subject to compliance with the national laws on the organization and operation of companies which may apply in the case of an equity joint venture. The terms and conditions of the contractual joint venture can easily be adapted to individual situations and amended when experience suggests that such a course is desirable.

12. Moreover, the legal structure of the contractual joint venture ensures that the partners obtain direct and immediate returns from the venture. In the equity joint venture, it is the new entity itself, a separate juridical person, that holds the ownership of any returns in the first instance. This circumstance may explain some preference demonstrated for contractual joint ventures, especially when the exploitation of natural resources is involved.

13. It has been suggested that difficulties may arise in reconciling the flexible legal structure of a contractual joint venture with strong and efficient management. However, the partners in a contractual joint venture can, when concluding the contract, agree to establish authorities having sufficient powers and financial means to manage the venture efficiently. Studies based on the experience gained from the operation of contractual joint ventures do not justify any categorial conclusions on this point, so that it cannot be stated with certainty that the flexible nature of this type of partnership is necessarily an obstacle to efficient management.

14. The question of duration of the venture is also likely to be raised at an early point, some kinds of arrangements being more susceptible to a project of limited duration than others. The nature of the undertaking will therefore tend to influence the form and duration of the joint arrangement entered into: a project limited to a particular operation or phase of operations is less likely to require any notion of permanence than is a fully integrated vertical venture for sea-bed mining, for example. In the former case, a contractual joint venture may be a more appropriate choice. In the latter case, the capital intensive nature of the venture will require a long period for the recovery of contribution with a fair and reasonable return, taking into account the risk factors entailed. Other questions central to the issue of duration are the mechanics for termination and the rights and obligations of the partners or joint entity itself subsequent to termination.

15. When entering into a joint arrangement, the partners must consider both the substantive aspects of the arrangement, such as contributions and manner of payment, and the business aspects, that is, how the relationship is effected. Regardless of which kind of joint venture is decided upon, the basic underlying considerations will be the same. However, some specifics may be peculiar to equity joint ventures, and therefore the broader range of considerations involved will principally be examined.

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C. Capital

16. Contributions of the partners can take many forms of tangible or intangible property. They may include cash, equipment, industrial property, resources, infrastructure, market, know-how, valuable concessionary rights, goodwill, etc. As a first step, it must be determined which contributions will be capitalized and which will not, because this forms the basis of determining shares in the venture. Cash contributions which are not capitalized will be loans, for example, and uncapitalized contributions of industrial property will likely be in the form of licenses, yielding royalties rather than profits.

17. The question of capitalization raises the question of valuation: contributions must be clearly identifiable for the purposes of capitalization. This is an issue particularly when a "package" of goods is contributed on one side. In exploration ventures, valuation of the resource itself and/or the mine site as contributions to capital may prove particularly perplexing, and some scheme for valuation would have to be devised to ensure each partner a fair return in any eventuality. In the process of capitalization and valuation for sea-bed mining ventures, the rules, regulations and procedures of the Authority and/or other governing law may provide some guidelines.

18. Financial contributions may be in the form of cash (as a contribution to equity or as a loan), access to loans, or the provision of loan repayment guarantees. Loans may be in the form of supplier's credits, consumer's credits, loans from one of the partners, long or short-term loans from third party public or private sources or other commercial credits. It is also possible that once the venture is operational, loans may be made from the venture's reserves. Responsibility for the loans will be the subject of negotiation. Repayment of loans may be in cash or in kind. Examples of in kind repayment would be repayment with equity, or via production-sharing or some other counter-trade arrangements.

19. The partners to the venture must decide upon what ratio between loan funds and capital contributions will be acceptable to them. Often the maximum permissible debt to equity ratio will be established in the governing law. The desired level of the debt/equity ratio will be partly a function of contributions and risks and will involve a determination of a fair and reasonable rate of return on investment. This level is likely to assume major importance in the negotiation process, especially in mining ventures, since the smaller the equity, the less the capital at risk and the larger the potentital for profitability. Furthermore, the sometimes high levels of capital outlays required may account for some reluctance to finance a major part of the total investment with equity.

20. Intangibles which may be contributed are likely to be in the form of industrial property, technical assistance and know-how. Industrial property includes patents, trade marks, trade names and trade secrets. Technical assistance and know-how would include all information for the effective use and continued up-dating of the industrial property, and to aid in the carrying out of the operations of the venture.

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21. Industrial property may be either assigned to the venture or licensed. If there is assignment, the property must be valued and will be considered a contribution to capital. The licensing or sub-licensing of the property, on the other hand, yields royalties. These royalties may be paid either in lump-sum or on a continuing basis, or some combination of the two. Lump-sum payments are usually made before the property is put to any use. Continuing basis royalties are dependent upon the extent to which the property is used. Royalties obligations may be fulfilled in the form of fully-paid shares in the venture or, instead of being actually paid, can be used to offset a partner's obligation to further contribute to capital. To this extent the industrial property can be considered a contribution to capital.

22. It is common for the contribution of industrial property to be in the form of a package which includes technical assistance and know-how. The process of valuation of the package for the purposes of capitalization would likely take into consideration the costs of transferring the property, related know-how, technical information and technical assistance to the joint venture, the value of any good faith or goodwill in its provision, its economic value to the venture, the value of royalties and the basis upon which they are determined, etc.

23. Having thus valued and capitalized contributions, a determination as to each partner's percentage of ownership may be made. If specific rights are to be consequent upon certain ownership, naturally that fact will be an important consideration in the valuation process. Those rights normally associated with ownership include participation in profits and in the distribution of assets upon dissolution or winding-up (the degree of participation in the latter is not necessarily dependent upon the former), as well as a voice in the control and management of the venture.

D. Control

24. The issue of control is central to any joint venture arrangement. Neither the equity nor the contractual joint venture involve predetermined procedures or machinery to deal with the problems of controlling and managing the venture enterprise. That is, both types of joint venture are susceptible to a variety of control and management arrangements which will be adapted to the circumstances of individual cases. In an equity joint venture, control and management are not necessarily dependent upon the number of shares held by each partner. In other words, a majority of equity participation need not necessarily imply control. In practice, the possession of technical expertise and "know-how" may be factors which heavily influence the control and management of the joint venture.

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25. Normally the control of an equity joint venture is vested in the board of directors of the corporate entity. The board may consist of both individuals and juridical entities, depending upon the law of the governing jurisdiction. Where the Enterprise is a partner to a joint venture, the permissibility under the governing law of having juridical entities on the board may be a determinative factor in the selection of governing jurisdiction. Alternatively, of course, the Enterprise may select independent individuals to represent it on the board. In any case, if a juridical entity is selected as a member of the board, the normal practice is for it to appoint an individual to represent it thereon.

26. Control will be the subject of negotiation between the partners, and certain external considerations may be dictated which will influence the final decision. These would include requirements of governing law regarding the size of the board and the minimum number of directors to be appointed by one or the other partner, requirements regarding the nature of participation in key management decisions, or requirements regarding external participation in certain decisions of the joint entity, such as major changes in structure or diversification in production plans. One can anticipate that in the latter case the input of the International Sea-Bed Authority may be required where the Enterprise is a partner in the venture.

27. The board of directors is traditionally responsible for the management and control of the joint entity, including the establishment of corporate policies. The board normally appoints the chief executive and other officers of the joint entity. Several factors will be taken into account when deciding upon the appropriate size of the board, including the number of partners involved in the venture, the percentage control of each partner, the ability of each partner to provide suitable directors, the desirability of having many different points of view and varying expertise represented on the board, the requirements for special majorities and voting arrangements, and considerations of business efficiency.

28. In addition, certain devices may be warranted for the protection of minority interests. Most commonly some kind of qualified voting scheme will be provided, requiring the approval of directors appointed by both parties, for questions involving capital investment, production, pricing of output, major contracts, budgetting, appointment of auditors, dividend distribution or retention of profits, and annual financial statements. Qualified voting of some kind may also be provided for appointment of the chief executive and other officers, sale of substantial capital assets, loans by the joint entity to partners, dissolution or liquidation, transfer of shares or issue of new shares, and changes in the joint venture agreement. An alternative to qualified voting for the protection of minority interests is to require unanimity for key decisions. The character of the shares issued (that is, ordinary, preferred or special classes) should be taken into account in this regard. Other possibilities regarding control are available as well, depending upon the particular circumstances and the underlying policy decisions made. For example, certain questions such as appointment of officers may be divorced from the traditional control of the board and spelled out specifically in the agreement between the partners.

29. The parties in a contractual joint venture enjoy considerable freedom to negotiate the terms according to which the management and control of the venture will be shared; all functions are carried out according to the provisions of the contract. The contractual joint venture therefore provides a very flexible framework within which almost any possible combination of terms and conditions may be agreed, and problems between the partners concerning management and control may be avoided by a careful negotiation of the contract. The more detailed the contracts establishing joint ventures are insofar as management and control are concerned, the smaller will be the risk of disputes and misunderstandings during the performance of the contract.

E. Financial Policies

30. The distribution of profits or benefits depends upon the form of organization or arrangement. In a contractual joint venture, financial benefits may encompass license fees (royalties), management fees, salaries, interest on debt capital or loans, indirect fringe benefits, production-sharing, guaranteed supplies or market guarantees, among other benefits. In an equity joint venture these benefits may be involved as well, but the question of participation in profits of the joint entity is the central concern.

31. Normally, participation is based upon percentage of ownership, however countervailing considerations may dictate a different formula. Such considerations may include the extent to which one of the partners is expected to undertake costly related expenses, such as training, processing or the provision of other services. If the extent of related obligations is large, then a larger financial incentive will generally be required. The reasonableness of the expected rate of return on investment will also be a consideration. In order to undertake a project to begin with, an investor will consider risk, opportunity costs and the market situation, generally seeking at least a specific rate of return in order to determine the viability of the project overall.

32. The question of applicable financial policies is one which should be incorporated into the agreement. The adoption of a policy to either retain or distribute profits will no doubt affect any decision regarding the manner of participation in profits. The rationale behind retention of profits may include allowance for accumulation of working capital, for expansion and reinvestment, for replacement of capital assets, for retirement of debt, or for compliance with or exploitation of any requirements or advantages provided by law. The joint venture agreement itself may directly or indirectly dictate retention of profits by providing for compulsory reserves, prior commitment to uses of profits or the rationale for or indication of intent to retain. Retention of profits, would not afford a partner any financial return on capital in the form of dividends, therefore that partner may seek to engage in a complementary arrangement for some other kind of financial advantage as well, as enumerated above.

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F. Liability and settlement of disputes

33. The question of where liability will lie is normally negotiated and specified within the joint venture agreement. When this has not been the case, the courts will apply ordinary principles of law and equity regarding responsibility. In some cases, the form of arrangment between the partners may determine the extent of individual liability. That is, under national law certain kinds of arrangments can be entered into which will specify the limits (or lack thereof) of liability.

34. Particular problems may be posed where the Enterprise is a partner in a joint venture if the precise limits of its possible liability are not specified. In an equity joint venture of limited liability under national law there may be no problem, however in a contractual joint venture or any equity arrangement where the partners are not shielded difficulties may arise.

35. The curious nature of the Enterprise as an autonomous organ of the Authority is raised in this respect. Several provisions of the Convention on the Law of the Sea delineate allocation of responsibility and the limits of liability (see e.g. annex III, article 22 and annex IV, articles 2(3) and 3), and these must be carefully consulted before any arrangement is concluded. Furthermore, some question is raised regarding sponsorship and the status of an equity joint venture as a contractor in its own right, since the new entity will possess juridical personality independent of that of the Enterprise. In this respect annex III, article 4 (4) must also be consulted regarding liability.

36. The settlement of disputes is also an issue normally included within a joint venture agreement. Often a specific forum or method of settlement is designated therein. Where this is not the case, it can be assumed that the application of governing law specified in the agreement may provide an appropriate procedure. Here again, however, a special case is presented by the Enterprise: while an equity joint venture, as an independent entity, may be amenable to suit in national courts, the Enterprise has been given rather broad privileges and immunities under the Convention, and may be amenable to the jurisdiction of national courts only under certain circumstances (see annex IV, article 13 (3)). The Enterprise may, however, be amenable to the jurisdiction of the International Tribunal for the Law of the Sea, under article 187 (2) (c) of the Convention. Depending upon the interpretation to be given to that article and to the requirements of sponsorship, there may be some question as to whether joint ventures with the Enterprise can have access to that forum as well.

37. The closely interrelated questions of liability and settlement of disputes are therefore extremely important and complex matters which must be carefully considered when negotiating joint arrangements. Perhaps the rules, regulations and procedures of the Authority relating to joint ventures with the Enterprise will provide some additional guidelines to be taken into account in this regard.

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LOS/PCN/SCN.2/WP.4
27 August 1984
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PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2
Geneva: 13 August - 5 September 1984

PROPOSAL ON JOINT VENTURE

Proposals by the delegations of Belgium, France, Germany, Federal Republic of, Italy, Japan, the Netherlands and the United Kingdom of Great Britain and Northern Ireland

INTRODUCTION

1. This paper discusses some of the key elements necessary for a successful joint venture agreement. However, it is clear that no hard and fast criteria can be established; and it is therefore important that the Authority's rules (annex III, article 9, paragraph 3 refers) should allow the Governing Board sufficient flexibility when negotiating with prospective partners. Annex IV, article 1, paragraph 3 requires the Enterprise to operate as a commercial entity and it should negotiate accordingly. A model agreement for establishing such a joint venture between the Enterprise and national private or State owned companies has been presented by the Delegation of the Federal Republic of Germany for Special Commission 2 of the Preparatory Commission for the International Sea-bed Authority and for the International Tribunal of the Law of the Sea on 21 August 1984.

The Convention

2. The main provisions for the conclusion of joint venture agreements between the Enterprise and qualifying applicants [hereinafter known as "the Investor"] e.g. commercial operators are:

(i) Annex III, article 9, paragraph 3 which states that "the Authority may prescribe, in its rules, regulations and procedures, substantive and procedural requirements and conditions with respect to joint ventures".

(ii) Annex III, article 11 which states that "contracts may provide for joint arrangements between the contractor and the Authority through the Enterprise, in the form of joint ventures or production sharing, as well as any other form of joint arrangement", and "partners in joint venture

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with the Enterprise shall be liable for payments required by article 13 of this Annex to the extent of their share in the joint venture, subject to financial incentives as provided for in that Article".

(iii) Annex III, article 5, paragraph 6 which states "in the case of joint ventures with the Enterprise, transfer of technology will be in accordance with the terms of the joint venture agreement".

(iv) Annex IV, article 6 (g) which states that the Governing Board (of the Enterprise) shall exercise the powers necessary to fulfil the purpose of the Enterprise, including powers "to establish terms and conditions, and to authorise negotiations, concerning joint ventures and other forms of joint agreements referred to in Annex III, articles 9 and 11, and to approve the result of such negotiations".

3. The Chairman of Special Commission 2 in his statement to the Plenary [LOS/PCN/L.5] described joint ventures as "the most feasible option" for the early entry into operation of the Enterprise. In LOS/PCN/SCN2/WP.1, paragraph 22, the Secretariat recalled that the Convention included the joint venture option for the Enterprise since "entry into joint ventures with experienced mining entities having tested technology seemed an important option to offer as a way of developing technological and financial capabilities".

4. Such joint ventures would clearly need to have regard to the respective interests of both the Enterprise and the Investor, but they would offer potential benefits to both parties. A joint venture would facilitate:-

(i) harnessing the organisational skills and proven technological capability of existing operators in the development of the parallel system of exploitation envisaged in the Convention;

(ii) the enhancement of the technological capabilities of the Enterprise through co-operation and the on-site training of personnel;

(iii) bringing forward the development of resources in the area reserved to the Enterprise;

(iv) the sharing of the substantial financial costs associated with a mining operation between the Enterprise and the Investor, and of the possible financial benefits forthcoming, thereby improving the prospects of further exploitation of the deep seabed;

(v) reducing the burden of the financial investment required through the opening up of greater opportunities for the external financing of a mining project.

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Operational orbit

5. The reduced costs and risks that can result from limiting a joint venture agreement to specific operational stages has, on occasion, been sufficiently attractive in land-based mining to provide an alternative to the integrated project. However, in the case of deep sea mining, with its attendant higher costs and risks, the participation of a potential Investor would be likely to depend on the expectation of a fair share of the potentially higher financial incentives that an integrated mining project offers. It is, however, possible to envisage the processing stage i.e. smelting and transportation forming the basis of separate agreements.

Corporate structure

6. A joint venture, or participation agreement, can take a variety of forms, for example, the Enterprise and the Investor may decide to form their own operating company, or they may elect to co-operate together sharing the profits. The parallel of the latter arrangement in land-based mining would be where the host State (through its State mining company) co-operates with the commercial company of which an example is the Colombian coal project, where each party shares equally the costs and profits associated with mining. Another approach in land-based mining (e.g. the copper and gold projects in Papua New Guinea) is for the host State to participate indirectly by acquiring a proportion of the commercial company's share capital; the State may initially have a low financial commitment during the high risk phase of the project but with the option to increase its share at a later stage when the profitability of the project is proven.

7. In the context of the Convention, the State, or State company role would in practice be performed by the Enterprise. There are, however, certain distinctions between the role of the State in land-based mining and the Enterprise in deep sea mining, for example in relation to the spin-off advantages from a mining project. These arise mainly at the processing stage in the form of multiplier effects on employment and are derived by the State in the case of land-based mining; but to the State where the processing is located. The precise structure of the joint venture will need to be adapted to the particular circumstances of each case.

Capital formation

8. The basis of a joint venture, or participation agreement, is the sharing of costs and benefits associated with a project, with the assessment by the respective parties of the balance of advantage determining the extent of their respective share and the locus of control. The agreement would cover the contribution of the resource, capital and technology, and the share of the potential financial benefits which are forthcoming.

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9. One possible arrangement would be for the Enterprise and the Investor each to contribute 50 per cent of the equity of the operating company (if one were set up); and each contribute 50 per cent of the ongoing capital investment and costs, e.g. by obtaining loans from international and national development banks as well as commercial sources. This would reduce the burden on States parties from 100 per cent to 50 per cent but the substantial capital costs involved would nevertheless be likely to constrain the Enterprise's ability to participate in more than one or two joint ventures; 50-50 participation in terms of equity and costs may not therefore be optimal. Moreover the desirability of not imposing too great a financial burden on States has been recognised in several land-based mining agreements. For example, in the case of the copper and gold projects in Papua New Guinea, the State's share of the commercial company's equity is of the order of 20 per cent; and in the case of the copper and nickel project in Botswana the State's share is about 10 per cent. In each of these cases the commercial company bears the costs and arranges finance.

Decision-making and control

10. There are essentially two aspects:-

(i) strategic decisions relating to the over-all project, e.g. general investment plan, work programme, general budget, etc.;

(ii) day-to-day operations.

11. The divisions of control powers between the parties in strategic matters will need to take account, inter alia, of the extent of their participation in the risks and benefits associated with the project, and the financial costs involved. In land-based mining agreements control in operational matters resides with the commercial company, with the States involved at a strategic decision-making level through, for example, having the power to approve or refuse the necessary plans (as in the case of the copper/gold project in Papua New Guinea); or through State-appointed directors on the company's board (Papua New Guinea and Botswana projects referred to earlier), or on an executive committee (Colombian coal project) on which both parties have equal representation. In all the agreements we have examined there is an arbitration procedure to settle disputes.

12. The place taken by the State in land-based mining agreements would, in deep sea mining, be fulfilled by the Enterprise which is the industrial arm of the Authority.

Transfer of technology

13. In land-based mining, transfer of technical knowledge appears to be taking place through the employment of local labour and on-site training; and this is perhaps as important as providing the necessary equipment to the State. The

question of transfer of technology under a joint venture agreement should be a matter for negotiation between the Enterprise and the Investor. Whilst the Investor will seek commercial terms for the transfer, and will expect there to be adequate safeguards to prevent proliferation to third parties, the introduction of technology on acceptable terms will be of mutual benefit to both parties and will be an essential element of a successful joint venture.

Other aspects

14. The following are also of importance:-

(i) Distribution of revenues

The Investor and the Enterprise will be looking for a fair share of the financial benefits in direct proportion to the costs and the risks being borne. There may be circumstances in which the Enterprise would prefer a royalty to revenue sharing.

(ii) Security of tenure

The Investor will want a firm agreement with regard to mining rights and the financial terms of the contract; and for a reasonable period of time. The conditions and procedures for termination and amendment will also need to provide adequate safeguards bearing in mind the experience of land-based mining agreements.

Conclusions

15. Joint ventures would seem to offer many potential advantages, in particular in providing a vehicle for the transfer of technology on a mutually acceptable basis, and in providing a means whereby the financial burden falling on States from the Enterprise developing an initial mine site may be reduced. Conversely the Enterprise, to the extent that it engages in joint ventures, may have the resources to develop a greater number of sites than would otherwise be the case, harnessing the proven skills and experience of commercial operators. The proposal of the Federal Republic of Germany [A Model Joint Venture Agreement for Sea-Bed Mining] presented to Special Commission 2 is one example of the form that a joint venture might take. It is likely that, given the different circumstances that will apply in each case, many different forms of joint venture might develop.

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LOS/PCN/SCN.2/WP.5
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PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEA-BED AUTHORITY
AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2

A MODEL JOINT VENTURE AGREEMENT FOR SEA-BED MINING

Submitted by the delegation of the Federal Republic of Germany

CONTENTS

Page

INTRODUCTION 83

I. MANGANESE NODULE MINING AGREEMENT IN RESPECT OF THE DESIGNATED AREA BETWEEN THE INTERNATIONAL SEA-BED AUTHORITY AND THE ENTERPRISE AND THE INVESTOR 88

II. COMMENTS ON THE INDIVIDUAL CLAUSES OF THE DRAFT AGREEMENT 112

Annex. INFORMATION ON THE AUTHORS 127

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INTRODUCTION

1. The discussion in Special Commission 2 has led to the conclusion that joint ventures between the Enterprise and national or transnational companies of high competence in the technology of deep-sea mining will be "the most feasible option" for the early entry into operation of the Enterprise (statement to the plenary by the Chairman of Special Commission 2, (LOS/PCN/L.5 of April 1984); see also background paper prepared by the secretariat of the Preparatory Commission, (LOS/PCN/SCN.2/WP.1 of 24 February 1984) and preliminary note submitted by the secretariat of the Asian-African Legal Consultative Committee on 6 February 1984). In fact, the same approach to the problem of enabling the Enterprise to commence sea-bed mining had already been recommended in a study on "A Joint Venture Agreement for Seabed Mining" prepared by the Institute for Foreign and International Economic Law in Frankfurt/Main at the request of the Minister of Economics of the Federal Republic of Germany which was subsequently published in 1981. 1/

2. In response to the request of Special Commission 2 for detailed studies on a model joint venture this paper presents a model agreement for establishing a joint venture between the Enterprise and national or transnational private or State-owned companies or consortia (hereafter summarily termed "investors"). This model agreement is an updated version of a draft already attached to the above-mentioned study of the Institute for Foreign and International Economic Law. The text of the model agreement is followed by a commentary on its provisions. The drafting of this model agreement was not meant to tie the discussion to the specific model clauses contained therein; other solutions are certainly conceivable and need examination. The purpose was rather to identify the issues that will have to be addressed and equitably solved in such an agreement if a mutually beneficial joint-venture relationship is to be brought about. The main features of the model agreement and of the reasons for the various solutions recommended therein are outlined in the following paragraphs.

3. It is assumed that in the initial phase a joint-venture operation of the Enterprise will most probably take place on a "reserved" site although the Enterprise is not precluded from operating also on "non-reserved" sites and incentives for joint ventures (United Nations Convention on the Law of the Sea, annex III, art. 11, para. 2, and art. 13, para. 14) might make it attractive for operators in the "non-reserved" area to have the Enterprise as joint-venture partner. In any event, a joint venture for exploring and exploiting a "non-reserved" site will by and large create the same problems and require similar solutions.

4. It is assumed that in the initial phase of the activity of the Enterprise the joint venture will cover only the mining stage (i.e. the recovery of the minerals from the sea-bed). The reasons are the following: The amount of investment and operating capital will be much lower than in the case of a fully integrated operation; this will facilitate the financing of the first generation of mining ventures. It does not seem advisable to burden the Enterprise in the initial stage with the additional personnel, technical, and financial problems of the processing and marketing stages. From the point of view of economics, the establishment of a

separate processing plant and a marketing organization is not justified on the basis of the exploitation of only one or perhaps two mine sites in the initial stage of the activity of the Enterprise. Finally, only the mining stage falls under the jurisdiction of the International Sea-bed Authority; the further stages (transport, processing and marketing) are beyond its jurisdiction and require a different legal structuring of the joint venture agreement taking into account the legal environment of the country where the processing plant will be installed. Thus, it is assumed that the recovered minerals are taken over by the joint-venture partner for processing and for the marketing of the metals derived therefrom. (The revenue-splitting problem created thereby is discussed below in paragraph 10). While these reasons are certainly valid in the early years of the activity of the Enterprise, they in no way preclude the possibility that, at a later time, the joint-venture partners will conclude a supplementary joint-venture agreement for subsequent stages of metal production.

5. The Enterprise will be free to choose its joint-venture partner on the basis of technical competence, financial capacity and commercial reliability; it may well be that a pioneer investor which has registered under resolution II and, at the specific request of the Preparatory Commission, explored the "reserved" site in question, offers itself as a suitable joint venture partner for this site, but the Enterprise as well as the pioneer investor remain free in this respect.

6. The model agreement recognizes the triangular relationship between the International Sea-bed Authority, the Enterprise and the investor:

(a) The concessionary relation between the Enterprise, as the holder of the mining rights, and the International Sea-bed Authority, as the controlling authority (termed "plan of work" in art. 153, para. 3, of the Convention and regulated in part A of the model agreement);

(b) The relation between the International Sea-bed Authority and the investor concerning the fiscal obligations, special financial incentives and security of tenure (termed "contract" in art. 11 of annex III to the Convention and regulated in part B of the model agreement);

(c) The joint venture relationship between the Enterprise and the investor (regulated in part C of the model agreement).

An arrangement along these lines - which is reflected in the interlinked parts A, B, and C of the model agreement - has parallels in land-based mining where the host State, a State-owned company holding the mining rights and the foreign investor enter into a tripartite agreement. The linking of parts A, B, and C of the model agreement which form an integrated whole (see the preamble to the model agreement) guarantees the control interest of the Authority as well as the investment security interest of the investor. An important element in this arrangement will be the extension of the security of tenure to the operating company formed by the joint venture partners (part B, art. 4, of the model agreement). An agreement establishing a joint venture relationship with respect to a "non-reserved" site might have the same legal structure, but it might be simplified in so far as the operating company (if such a company is formed by the joint-venture partners) may by itself acquire a "contract" from the Authority.

7. The model agreement provides for the establishment of an "operating company". The Enterprise and the investor may choose to co-operate in a loose form of common undertaking with shared profits and losses, generally termed "contractual joint venture" in international practice, or they may form a separate operating company which may or may not be incorporated, thereby creating what is termed an "equity joint venture" in international practice. The model agreement follows the latter practice and assumes that the operating company formed by the joint venture partners will be incorporated in order to provide it with a separate juridical personality. There are strong reasons for incorporating the operating company in view of its participation in the commercial and financial markets. In particular, incorporation establishes a clear-cut separation between the operations and assets of the operating company and those of both joint-venture partners. The selection of the seat of the operating company and the law of incorporation, however, may pose problems because the operating company, which has no legal immunity, will be subject to the legal order of the host State.

8. The decision-making system recommended in the model agreement (see below, para. 9) will not primarily depend on the ratio of capital participation among the joint-venture partners. Thus, this ratio is not of prime importance and may be based primarily on the working capital needed; the delicate negotiation problem of the valuation of the mining site brought in by the Enterprise and of the technology brought in by the investor could probably be facilitated thereby (see part C, art. 4). The model agreement assumes that each partner will have to contribute 50 per cent of the equity and provide for 50 per cent of the loans. The low debt/equity ratio of 1 : 1 expresses the assumption that the operating company will have a low borrowing capacity, particularly in the initial phase; only at a later stage could equipment and nodules be objects of security. The Enterprise and the investor will probably have to give additional guarantees for the loans.

9. The most critical issue is a workable decision-making mechanism. It is assumed that each joint-venture partner will wish to exercise direct control over all major decisions but may be prepared to accept decisions of minor importance or of a routine character if they are developed within workable common institutions in which the interests of the partners are adequately represented. The general control over the joint-venture operations is exercised through the establishment of a general investment plan (part C, art. 7). The plan is to be agreed directly between the Enterprise and the investor and will serve as a general normative framework for the decision-making within the operating company. The proposal for such a plan is based on the experience in land-based mining ventures where well functioning agreements rely on detailed catalogues of understanding relating to the economic and technical progress of the joint venture. Within the operating company the principal decision-making organ is the Board of Directors (part C, art. 6) while the day-to-day operational decisions are left to a managing director (part C, art. 8). The Board of Directors is composed of an unequal number of members; each joint-venture partner commissions an equal number of members, and all commissioned members elect an additional "neutral" member with special expertise. This composition is conducive to neutralizing a number of problems before the deadlock-breaking vote is required, and will give the operating company a certain amount of autonomy, subject of course to the guidelines prescribed in the general investment plan. The Managing Director is to be elected, and subject to recall, by the Board of Directors. For the first 10 years, however, he will be nominated and subject to recall by the investor. This arrangement is similar to solutions found

in some recent land-based mining agreements (e.g. in the new Jamaican agreements, the Sar Chesmeh agreement and the Cerro Colorado agreement). Through his close relation to the technology-owner an effective start of the operations and the initial technology transfer will be facilitated.

10. With regard to the revenue-splitting system, as it is assumed that the joint venture remains confined initially to the mining stage and the recovered polymetallic nodules are taken over by the joint-venture partner for processing and marketing, an equitable mechanism for sharing the proceeds which result in total from the mining, processing and marketing of the metal value of the nodules between the joint-venture partners must be devised so that one operational stage does not generate excess profits at the expense of another (at least as long as there exists no reliable market price for the nodules). The model agreement takes care of this problem specifically (part C, arts. 9-14); it follows, in principle, the method employed in article 13 of annex III to the Convention for calculating the share of the net proceeds from the recovered nodules that will be due to the Authority under a mining contract. The revenues from the sale of the processed minerals are reduced by the total of the operating costs of both the mining and the processing/marketing sector; the net proceeds so obtained are then attributed to each sector in proportion to each sector's capital investment, thus producing an equal rate of return for each sector of the invested capital. The model agreement, however, varies the calculatory elements of this method slightly in order to eliminate its inherent weakness which consists in not giving enough incentive to each sector to reduce its operating costs because their calculatory effect is shared indiscriminately by both sectors. Therefore, the model agreement proposes to "freeze" the revenue-splitting factor, which normally would be calculated on the basis of last year's result, periodically for several (three) years. The effect will be that, for example, the mining sector may secure for itself extra profits if the operating company reduces its operating costs during such a "freeze" period by rationalization or by prudent procurement of goods and services.

11. Article 5, paragraph 6, of annex III to the Convention provides that in the case of a joint venture with the Enterprise, transfer of technology will be regulated by the terms of the joint-venture agreement. Thus, this provision allows dispensing with the complicated and cumbersome procedure of article 5, paragraphs 1 to 5, for enforcing the transfer obligation of the contractor. It leaves the parties to a joint-venture agreement wide discretion and flexibility on how to arrange for the use of the required technology in the operation of the joint venture and for the enjoyment by the Enterprise of the benefits therefrom. In the situation of a joint venture the sharing of technology will be the natural consequence of the parallel interest of the joint-venture partners in the most effective and economic exploitation of the mine site. Transfer of technology will in such an environment cease to be an additional burdensome charge on the investor for obtaining a mining contract. Within the intimate relationship between the joint-venture partners the acquisition and development of the required technology will be rather an intra-company matter than a one-way transfer from the investor to the Enterprise. Although it is clearly in the investor's own interest to provide the operating company with the best technology available, the model agreement nevertheless lays down a general obligation of the investor (part C, art. 16) to make available to the operating company the necessary technology (equipment,

patents, licences, technical knowledge and assistance) for a sea-bed mining operation at the best available standards and to assist the operating company to obtain such technology, if necessary, from other sources on fair, equitable and commercial terms. The Enterprise and the investor may agree on supplementary provisions (e.g. defining the price of the transferred technology or protecting the transferred technology against proliferation to competitors) or on more detailed arrangements as to the specific equipment, patents, licences and know-how to be transferred where they regard such additional agreements necessary or useful.

12. The model agreement leaves open whether the investor should go beyond this obligation and make his technology available not only to the operating company (and in this context also to the Enterprise in its capacity as partner of the operating company), but also to the Enterprise for use in other "reserved" or even "non-reserved" sites. This question presents itself here in quite a different environment than under the premise of article 5 of annex III to the Convention which assumes that the Enterprise needs the technology to start mining in a "reserved" site alone. Under a joint-venture agreement, however, the "reserved" site is already mined on behalf of the Enterprise by the operating company. An obligation of the joint-venture partner to transfer technology to the Enterprise for use elsewhere would go beyond the object and purpose of the joint venture and is not provided for in article 5, paragraph 6, of annex III. The model agreement refrains, therefore, from imposing such an obligation on the joint venture partner of the Enterprise. On the other hand, the investor may well have a commercial interest to sell the technology which is used or developed in the joint venture operation to the Enterprise for use elsewhere provided that there is no proliferation to competitors. It does not seem advisable to coerce the investor into a transfer on non-remunerative terms because such an arrangement will not be in the interest of both joint-venture partners: it reduces the incentive to enter into joint-venture agreements, and, more seriously, it stifles the indispensable efforts for continuous innovation and development.

13. A further point should be stressed in this context. The model agreement provides (part C, art. 17) for the training of Enterprise personnel in the technology used in the joint-venture operations. The personnel of the Enterprise which is employed in or is in contact with the operating company will acquire, by that fact alone, knowledge of the technical processes used by the operating company. It will be unrealistic to assume that they will not or should not use that knowledge in the Enterprise's other operations; it is one of the very purposes of providing these training opportunities. Only proprietory know-how, in particular patents, licences or other legally protected know-how, could not be freely used elsewhere but would have to be acquired for that purpose on commercial terms.

14. The model agreement given specific attention to the problem of conflict resolution and more particularly to mechanisms of conflict avoidance. The model agreement provides for a set of institutionalized procedures for resolving differences which may arise between the joint venture partners about investment or operational policies before such differences evolve into open legal conflicts:

(a) The general investment plan, if clear and detailed enough, will keep the decisions of the Board of Directors and of the Managing Director of the operating company within foreseeable limits (part C, art. 7);

(b) The "neutral member" on the Board of Directors of the operating company may serve as an internal conciliator (part C, art. 6, para. 3);

(c) The institutionalized renegotiation procedure will help to adjust those terms of the joint-venture agreement or the general investment plan which have been rendered impracticable or inequitable to one of the joint-venture partners (part C, art. 22, para. 1); the procedure starts with the forming of an "internal" special renegotiation committee (part C, art. 22, para. 2) and, if no settlement is reached on the recommendations of the Committee, it may then be carried before an "external" board of conciliators (part C, art. 22, para. 3).

15. The renegotiation procedure is of particular importance in the case of joint ventures because the Convention expressly provides that an agreement establishing a joint venture with the Enterprise can be revised only by mutual consent of the parties (art. 11, para. 1, art. 19, para. 2, of annex III to the Convention); moreover, such an agreement is not subject to judicial review.

16. For legal disputes relating to the interpretation and application of the provisions of the joint venture agreement, the model agreement follows the pattern of the Convention: for disputes with the International Sea-bed Authority, articles 187, paragraph (c) (i) and (ii), 188, paragraph 2 (a), and 15, paragraph 15, of annex III to the Convention will apply respectively (part B, art. 7); for disputes between the investor and the Enterprise relating to part C of the model agreement, commercial arbitration will apply under the UNCITRAL Arbitration Rules (part C, art. 20).

I. MANGANESE NODULE MINING AGREEMENT IN RESPECT OF THE DESIGNATED AREA BETWEEN THE INTERNATIONAL SEA-BED AUTHORITY AND THE ENTERPRISE AND THE INVESTOR

WHEREAS the Enterprise is willing to develop and to implement its competence in sea-bed mining, is holding a mining option for the reserved designated area and has submitted to the Authority a plan of work for the designated area, and

WHEREAS the Investor possesses the financial and technological capability necessary to undertake and carry out sea-bed mining of manganese nodules, and to train the personnel of a joint operating company formed by the Enterprise and the Investor on all administrative and technical levels required to carry out sea-bed mining,

NOW, THEREFORE, the parties hereto simultaneously approve of and agree on the following tripartite agreement for the mining of manganese nodules consisting of parts A, B, and C, which form an integrated whole and shall be construed accordingly:

/...

Summary of clauses

PART A

ARTICLE 1: Grant of rights

ARTICLE 2: Assignment of rights to Operating Company

ARTICLE 3: Exploration period

ARTICLE 4: Feasibility study and design of operations

ARTICLE 5: Exploitation period

ARTICLE 6: Benefits to developing countries

ARTICLE 7: Reports, documents and other data

PART B

ARTICLE 1: Transfer of technology

ARTICLE 2: Fiscal obligations

ARTICLE 3: Control by the Authority

ARTICLE 4: Security of tenure

ARTICLE 5: Default and *force majeure*

ARTICLE 6: Termination

ARTICLE 7: Dispute settlement

ARTICLE 8: Applicable law

PART C

ARTICLE 1: Formation of a joint company

ARTICLE 2: Principal office

ARTICLE 3: Capital proportion

ARTICLE 4: Initial capital

ARTICLE 5: Financing, commercial exploitation

ARTICLE 6: Board of Directors

/...

ARTICLE 7: General investment plan

ARTICLE 8: Managing Director

ARTICLE 9: Distribution of net profits

ARTICLE 10: Sale and pricing of nodules - revenue-splitting scheme

ARTICLE 11: Operating costs

ARTICLE 12: Development costs

ARTICLE 13: Accounting, auditing and currency translation

ARTICLE 14: Review and audit for the determination of the revenue-splitting factor

ARTICLE 15: Procurement of goods and services

ARTICLE 16: Transfer of technology: equipment, services and know-how

ARTICLE 17: Transfer of technology: training by the Operating Company

ARTICLE 18: Transfer of technology: training by the Investor

ARTICLE 19: Default and *force majeure*

ARTICLE 20: Dispute settlement

ARTICLE 21: Applicable law

ARTICLE 22: Renegotiation

ARTICLE 23: Termination and assignment

General definitions

1. Affiliated party

A person shall be considered as an affiliate of another person if the first person, directly or through any third person or persons, controls, is controlled by, or is under common control with, the second person. The term "control" means the possession, directly or indirectly of the power to direct or cause the direction or the management and the policies of a person, whether through the ownership of voting securities or by contract or otherwise. In all events, control shall be deemed to include ownership, directly or through any third person or persons, of an aggregate of ____ per cent or more of either the voting power of equity interests of a person.

/...

2. Agreement

The term "agreement" shall mean the whole tripartite agreement between the Authority, the Enterprise, and the Investor consisting of parts A, B, and C, and the annexes attached to it.

3. Authority

The term "Authority" means the International Sea-bed Authority as established under the United Nations Convention on the Law of the Sea.

4. Convention

The term "Convention" shall mean the United Nations Convention on the Law of the Sea (1982).

5. Date of this agreement

The term "date of this agreement" shall mean the date on which this agreement shall become binding on the three parties to this agreement.

6. Designated area

The term "designated area" shall mean that area of the sea-bed covered by the plan of work approved by the Authority and described in a schedule to this agreement.

7. Enterprise

The term "Enterprise" shall mean the organ of the Authority which is established under article 170 of the Convention.

8. Exploration period

The term "exploration period" shall mean the period referred to in part A, article 3, of this agreement.

9. Force majeure

The term "*force majeure*" shall be used as defined in part B, article 5, paragraph (2), of this agreement.

10. Investor

The term "Investor" means the investor or the investors' consortium listed in a schedule to this agreement.

11. Market value of the nodules' metal content

The term "market value of the nodules' metal content" shall mean the price as defined in part C, article 10, paragraph (3), subparagraph (3), of this agreement.

/...

12. Operating Company

The term "Operating Company" shall mean the company set up by the joint-venture partners, the Enterprise and the Investor, in accordance with part C of this agreement.

13. Period of commercial exploitation

The term "period of commercial exploitation" shall mean the period defined in part A, article 5, of this agreement.

PART A

APPROVAL OF ENTERPRISE'S PLAN OF WORK

WHEREAS the Enterprise has the option to carry out activities in the reserved designated area and is prepared to enter into a joint-venture agreement with the Investor pursuant to the terms set forth in Part C, and

WHEREAS the Authority is considering a grant of fiscal incentives and the assurance of security of tenure to the Investor and the Operating Company, as outlined in Part B,

NOW, THEREFORE, the Authority approves of the plan of work submitted to it by the Enterprise as follows:

ARTICLE 1

Grant of Rights

(1) The Authority grants to the Enterprise the exclusive right to carry out all exploration and exploitation in the area with respect to manganese nodules.

(2) In the event that any other mineral or natural resource is discovered in the area, and the Operating Company wishes to exploit such mineral or natural resource, the Enterprise shall apply to the Authority for approval of an additional or amended plan of work to exploit such mineral or other natural resource.

ARTICLE 2

Assignment of rights to Operating Company

(1) The Authority approves that the Enterprise intends to carry out its activities in the area through the Operating Company formed by the Enterprise with the Investor pursuant to the terms of the joint venture agreement as set forth in part C.

(2) The Operating Company shall have full title to all manganese nodules recovered by it.

/...

(3) The Authority will exercise control over the activities of the Operating Company as provided in the Convention.

ARTICLE 3

Exploration period

(1) The exploration period shall begin _________ months after the date of this agreement.

(2) Within the exploration period and regarding the designated area, the Operating Company will collect the following data:

(a) The abundance of nodules on the ocean floor;

(b) The value of the metal content;

(c) The sediment characteristics;

(d) The topography of the sea-bed;

(e) The parameters of the water column.

ARTICLE 4

Feasibility study and design of operations

(1) Within _______ months after completion of the exploration work, the Operating Company will furnish a copy of the feasibility study to the Authority.

(2) This feasibility study will include all technical data, the project design, a comprehensive financial analysis and a description of all necessary steps to implement the operation during the project life.

ARTICLE 5

Exploitation period

(1) The period of commercial exploitation shall begin within _____ months after the Enterprise and the Investor have determined that the project is viable.

(2) It is understood that, with the commencement of commercial exploitation, the Investor will ensure that the mined product is purchased at fair and reasonable terms according to the scheme developed under part C attached hereto and made a part hereof.

/...

(3) The right of commercial exploitation is granted for a period of 25 years and for a yearly recovery rate of 3 million dry short tons of nodules which are considered to have a nickel content of ______ short tons.

(4) If the designated area proves insufficient to yield a production of 3 million dry short tons of nodules per year over the period of commercial exploitation, the Enterprise will submit an amendment to this plan of work indicating an additional area that the Enterprise wishes to explore and exploit through the Operating Company. The Authority will approve of such plan of work if the grant of the additional area is necessary to achieve the defined production goal.

(5) In the event of force majeure, the period of commercial exploitation will be extended in accordance with part B, article 5, paragraph (4).

ARTICLE 6

Benefits to developing countries

To implement the objectives set forth in the Convention, the Enterprise will use its best efforts within the Operating Company

(i) To secure the training and employment of personnel from developing nations;

(ii) to encourage the use of goods and services originating in developing countries.

ARTICLE 7

Reports, documents and other data

The Enterprise will make sure that the Operating Company submits all reports, maps, documents and other data which are necessary and relevant to the effective implementation of the powers and functions of the principal organs of the Authroity in regard to the designated area.

PART B

CONTRACT CONCERNING FISCAL INCENTIVES AND SECURITY OF TENURE

WHEREAS the Enterprise has submitted to the Authority a plan of work concerning the designated area, and

WHEREAS the Enterprise and the Investor are willing to enter into the joint venture agreement set forth under part C.

NOW, THEREFORE, the Authority and the Investor conclude the following contract:

/...

ARTICLE 1

Transfer of Technology

The Investor assures that he will use his best efforts to make available to the Operating Company all technological and managerial information and know-how necessary for the carrying out of efficient sea-bed mining in accordance with part C, articles 16 to 18, of this agreement.

ARTICLE 2

Fiscal obligations

(1) Provided that the Investor receives on time his share of net proceeds due under part C, article 9, he shall be liable for the financial payments required under annex III, article 13, of the Convention to the extent of his joint-venture share, i.e. 50 per cent of the total investment costs of the Operating Company.

(2) However, in accordance with annex III, article 11, paragraph 3, of the Convention, the Investor's general fiscal liability is reduced by the following fiscal alleviations:

(a) The annual fixed fee payable from the date of this agreement is ______________.

(b) Since the Investor chooses to make his financial contribution upon commencement of commercial production by paying a combination of a production charge and a share of net proceeds (mixed system) the payments will be determined as follows:

The production charge will be fixed at a percentage of the market value of the processed metals produced from the nodules extracted from the designated area in accordance with the following schedule:

(i) First period of commercial production ...

(ii) Second period of commercial production ...

If, in the second period of commercial production, as defined below under ..., the return on investment to the Investor in any accounting year shall fall below ____ per cent, the production charge shall be ____ instead of ____ in that accounting year.

The said market value shall be the product of the quantity of the processed metals produced from the nodules extracted from the area and the weighted average prices for those metals during the relevant accounting year using the procedure established in annex III, article 13, paragraph 6, subparagraphs (7) and (8), of the Convention.

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The authority's share of net proceeds shall be determined in accordance with the following incremental schedule:

That amount of net proceeds representing a return on investment of:	First period of commercial production	Second period of commercial production
	%	%
Greater than 0% but less than 10%	____	____
Greater than 10% but less than 20%	____	____
Greater than 20%	____	____

(3) The first period of commercial production shall commence in the first accounting year of commercial production and terminate in the accounting year in which the cash surplus obtained by the Investor, that is, his net profit obtained under part C, article 9, less his payments to the Authority in the preceding accounting years, shall exceed for the first time fifty per cent of the Operating Company's development costs with interest at ten per cent on that portion of development costs which has not been recovered as cash surplus. The second period of commercial production shall commence at the conclusion of the first period and continue until the end of the contract.

(4) The term "net proceeds" in paragraph (2) (C) means the Investor's share of the Operating Company's net profit as defined in part C, article 9, of this agreement, less the production charge or annual fixed fee payable to the Authority, less the recovery of development costs and less the recovery of research and development expenses attributable to the mining sector.

(5) Recoverable development costs referred to in paragraph (4) shall be fifty per cent of the Operating Company's development costs as defined in part c, Article 12, paragraphs (1) and (2), and shall be recovered in accordance with the procedure described in part C, article 12, paragraph (3), of this agreement.

(6) The Investor's research and development expenses attributable to the mining sector shall be recovered in ten equal annual instalments from the date of commencement of commercial production. The total creditable research and development costs may not exceed the sum of ____ United States dollars. The account for research and development expenditures will be prepared by the Investor and may be examined by the Authority through an independent accountant.

/...

(7) The term "return on investment" in paragraph (2) shall mean the ratio of Investor's net proceeds in that accounting year to the development costs as defined in paragraph 5. Development costs for the purposes of this paragraph shall include expenditures on new or replacement equipment less the original cost of the equipment replaced.

(8) For matters of construction, annex III, article 13, of the Convention shall be applied accordingly.

ARTICLE 3

Control by the Authority

(1) The Investor will make sure that the Operating Company submits all reports, maps, documents and other data which are necessary and relevant to the effective implementation of the powers and functions of the principal organs of the Authority in respect of the designated area. In the case of deliveries or sales between the Operating Company and the Investor or his affiliates, the Investor will provide, on request, all information necessary to demonstrate that these transactions were carried out at market prices or at arm's-length conditions. If the transactions cannot be so justified, the pricing shall be determined by the Authority after due consultation with the Investor, as if the transactions had been the result of free market or arm's-length transactions, taking into account relevant transactions in other markets.

(2) All costs, expenditures, proceeds and revenues and all prices and values referred to in this article shall be determined in accordance with generally recognized accounting principles.

(3) The payments to the Authority shall be made in accordance with annex III, article 13, paragraph 12, of the Convention.

ARTICLE 4

Security of tenure

(1) The Authority hereby declares that the Investor and the Operating Company shall enjoy security of tenure in accordance with article 153, paragraph (6), and annex III, article 16, of the Convention.

(2) The provisions of part A or B of this agreement may be revised only with the consent of all parties to the agreement.

(3) Any revision of part A is furthermore subject to approval by the Board of Directors of the Operating Company.

(4) Annex III, article 19, of the Convention will be applied accordingly.

ARTICLE 5

Default and force majeure

(1) Any failure by either party to carry out any of its obligations, other than obligations for the payment of money, shall not be deemed a breach of contract or default if such failure is caused by force majeure.

(2) Force majeure shall, without limitation, include wars, revolutions, insurrections, civil disturbances, blockades, embargoes, strikes and other labour conflicts, riots, epidemics, earthquakes and other seismic disturbances, storms, floods, lightning or other adverse weather conditions, explosions, fires, order or directions of any de jure or de facto Government or instrumentality or subdivision thereof, acts of God or the public enemy, breakdown of facilities or machinery, wherever occurring and any cause (whether or not the kind hereabove described) over which the affected party has no reasonable control and of such nature as to delay, curtail or prevent timely action by the party affected.

(3) The parties hereto understand that, for the purposes of this article, no delay or failure on the part of the Authority shall be deemed to be beyond the Authority's reasonable control if the delay or failure was caused by or arises from any act or omission of the Authority or any organ or employee of the Authority.

(4) If any activity is delayed, curtailed or prevented by force majeure, then the time for carrying out the activity thereby affected shall be extended for a period equal to the total of the periods during which such causes or their effects were operative.

(5) The party whose ability to perform its obligations is affected by force majeure shall notify the other party thereof in writing as promptly as possible, stating the nature of the force majeure, and the parties shall endeavour to do all reasonably within their power to remove such cause; provided, however, that no party shall be obligated to resolve or terminate any disagreement with third parties, except under conditions acceptable to it or pursuant to the final decision of any arbitral, judicial or statutory agencies having jurisdiction finally to resolve the disagreement.

(6) Notwithstanding the preceding paragraphs of this article, in the event the Investor shall be found to be in default in making any payment of money to the Authority which payment the Investor is required to make pursuant to article 2 of this part, then the period within which the Investor shall correct such default shall be thirty days after the receipt of notice thereof. The penalty for late payment shall be an interest charge on the amount in default for the period from the date the payment was due until actually received by the Authority, at the rate of (e.g. the New York prime interest rate) in effect at the date of default plus four per cent (4%). This penalty and other penalties provided for in this agreement may not be taken as deductions in calculating net proceeds under article 2 of this part.

/...

ARTICLE 6

Termination

(1) If over a period of two (2) years during the period of commercial exploitation, the Investor incurs, after payment of the production charge or annual fixed fee to the Authority, net losses from his participation in the Operating Company, then the Investor may withdraw from the Operating Company and from this agreement.

(2) To effect such a withdrawal, the Investor shall give a notice of withdrawal not less than six months before the intended withdrawal shall take effect. Upon receipt of such notice, within a period of three months, the Authority will consider whether it will grant to the Investor temporary or permanent fiscal concessions which render the investment a commercially viable participation in the Operating Company.

ARTICLE 7

Dispute settlement

(1) The Sea-Bed Disputes Chamber of the Law of the Sea Tribunal shall have jurisdiction over disputes concerning the interpretation or application of this part of the agreement and over acts or omissions of either party to this part of the tripartite agreement relating to activities in the designated area and directed to the other party or directly affecting that party's legitimate interests, including interests in the Operating Company established under part C.

(2) However, at the request of any party to the dispute, the dispute referred to in paragraph (1) shall be submitted to binding commercial arbitration. If in the course of such arbitration the arbitral tribunal determines that its decision depends on a question of interpretation of the Convention, the arbitral tribunal shall refer such question to the Sea-Bed Disputes Chamber for a ruling on such question. The arbitral tribunal shall then proceed to render its award in conformity with the ruling of the Sea-Bed Disputes Chamber.

(3) Unless the parties to the dispute otherwise agree, the arbitration shall be conducted in accordance with the UNCITRAL Arbitration Rules.

ARTICLE 8

Applicable law

The law applicable to this part shall be the provisions of part XI of the Convention, the rules and regulations prescribed by the Authority, the terms and conditions of this contract and other rules of international law not incompatible with the Convention.

PART C

JOINT VENTURE AGREEMENT BETWEEN THE ENTERPRISE AND THE INVESTOR

WHEREAS the Enterprise has submitted a plan of work for the designated area to the Authority for approval,

and

WHEREAS the Investor and the Authority are prepared to enter into a contract concerning fiscal incentives and security of tenure to the Investor to promote the following Joint Venture Agreement,

NOW, THEREFORE, the Enterprise and the Investor conclude the following joint venture agreement:

ARTICLE 1

Formation of a joint company

(1) The Enterprise and the Investor will form a joint company with the name of "Manganex Inc." which shall be the Operating Company and which shall have the objective of mining for manganese nodules and related minerals and natural resources and of shipping the mined resources to a processing facility.

(2) "Manganex Inc." will be a corporation formed according to the laws of _________.

ARTICLE 2

Principal office

"Manganex Inc." shall have its principal office and effective management in _______.

ARTICLE 3

Capital proportion

The capital of the Operating Company shall be owned in the following proportion:

Enterprise 50 per cent; Investor 50 per cent.

/...

ARTICLE 4

Initial capital

(1) The initial capital of the Operating Company will be 70 million United States dollars and concerns the exploration period. Neither the rights of the Enterprise to mine the area nor the past expenses of the Investor and its affiliates for research and development in the field of sea-bed mining technology shall be valued as an initial capital contribution. Rather, these rights and expenses shall be recognized in the distribution of the proceeds of the Operating Company.

(2) The initial capital shall be paid in cash or as attributable deliveries at market prices.

ARTICLE 5

Financing, commercial exploitation

(1) The partners agree that, if the exploration leads to a commercially viable project, they shall raise for use by the Operating Company another 190 million United States dollars or such other amount as agreed between them. The financing will be brought up as follows:

(2) The Enterprise and the Investor shall each pay 30 million United States dollars as working capital. The remaining 130 million United States dollars will be raised as debt from public and private sources.

(3) Each partner shall be responsible for financing its proportionate share in any increase in capital and debt. The Investor will assist the Enterprise in arranging loans from financial institutions in its home country and from other public and commercial sources. However, it assumes no obligation to offer such financing itself.

(4) To the extent to which the Operating Company is not in the position to raise the financing on its own, the partners will, with respect to their shareholding, give the necessary assistance, pro rata e.g. provide guarantees.

(5) The Operating Company will give all securities which the lenders may reasonably request for the purpose of granting the financing foreseen in the preceding provisions. In particular, the partners agree that the mining vessels will sail under the flag of ____________________ or such flag as the Board of Directors may determine upon request by a major lender.

ARTICLE 6

Board of Directors

(1) The Operating Company shall have a Board of Directors consisting of seven (7) members.

/...

(2) The Enterprise and the Investor shall each select three directors to the Board of Directors. The Chairman of the Board shall be named by the directors elected by the Enterprise and by the Investor, respectively. The directors elected by the Enterprise shall name the first Chairman. The Chairman shall serve for a term of one year.

(3) The six directors elected pursuant to paragraph (2) shall elect the seventh member of the Board of Directors whose term shall be two years. All nominees to the position of seventh member shall show professional qualities relating to the management and technical administration of mining. The election of the seventh member of the Board shall be public and unanimous.

(4) The Board of Directors shall have the power to:

- Approve or disapprove any investment;
- Dispose of a major capital asset;
- Delegate or revoke responsibilities except those expressly regulated in this agreement;
- Create or liquidate reserves;
- Raise or make loans and give guarantees;
- Set initially, cease, suspend temporarily, reduce, as well as increase production and take any measure with respect to production which is in the best interest of the Company;
- Distribute profits;
- Select the Company's auditor and its alternate;
- Approve or disapprove working programmes and plans;
- Approve or disapprove construction and development plans;
- Approve or disapprove budgets and other financial plans;
- Dispose of all other matters that the joint venture partners may confer upon it.

(5) In its decisions the Board of Directors shall observe the guidelines set forth in the general investment plan agreed on by the Enterprise and the Investor.

ARTICLE 7

General investment plan

Prior to the beginning of the two investment periods, i.e. the exploration period and the period of commercial production, a general investment plan shall be drawn up and agreed upon by the parties. This plan shall consider the complete technical design of the operations and prescribe the financial terms for the project periods consistent with established financial project analysis. The data and projections shall serve as a guideline for the decision-making of the Board of Directors and the management of the Operating Company. Any deviation from the projections shall be justified by factual circumstances which proportionally influence the projections.

ARTICLE 8

Managing Director

(1) The highest executive of the Operating Commpany shall be the Managing Director. He shall be elected and subject to recall by the Board of Directors. For the first ten years of the operation of the Operating Company the Managing Director will be elected and subject to recall upon recommendation by the Investor.

(2) The Managing Director shall be directly responsible to the Board. All personnel connected with the operation of the Company will be responsible solely to the Managing Director. He shall have the exclusive right of, and responsibility for, conducting day-to-day operations, and in particular for the following:

(i) Drawing up semi-annual operational and investment budgets for the approval of the Board of Directors, and implementing said budgets;

(ii) Appointing such personnel, temporarily or otherwise, as he may deem necessary in his sole opinion for the efficient running of operations;

(iii) Inviting tenders for and negotiating any resulting construction, building and development contracts and signing such contracts but only after due approval by the Board of Directors if the contract value exceeds ________ United States dollars;

(iv) Deciding on changes in the production rate, provided that these changes do not materially differ from the production rates provided for in the general investment plan and are in accordance with the limits of the authorized production ceiling under article 151 of the Convention and part A, article 5, paragraph (3), of this agreement. This right shall include the decision to stop production on a temporary basis for reasons such as technical breakdowns, strikes or similar matters. For periods in excess of _____ hours, the Managing Director shall be obliged to inform the Board of Directors immediately.

/...

(3) The Board of Directors shall pass such resolutions as are necessary to authorize the Managing Director to fulfil the above-mentioned and any other duties and responsibilities and to bind the Operating Company within the limits set out above. The Managing Director shall be permitted to attend all Board meetings. At these meetings the Managing Director shall inform and otherwise assist the Board in its decisions but the Managing Director shall not have a vote.

ARTICLE 9

Distribution of net profits

(1) All net profits of the Operating Company shall be split equally between the parties.

(2) The annual net profit is defined as gross revenue obtained under the revenue-splitting scheme set out in article 10 plus any other income,

minus

(i) Operating costs as defined in article 11;

(ii) Interest on loans and other charges;

(iii) Reserves.

ARTICLE 10

Sale and pricing of nodules - revenue-splitting scheme

(1) The Investor assumes the obligation to purchase the nodules mined by the Operating Company. The Operating Company will be responsible for shipping them to the harbour _____.

(2) The sales price of the nodules to the Investor shall be expressed on an annual basis as a share of the market value of the nodules' metal content in accordance with the following scheme:

$P = F \times V$

where

P = sales price of the nodules, i.e. Operating Company's share of the market value of the nodules' metal content

F = Revenue-splitting factor

V = Market value of the nodules' metal content

The revenue-splitting factor shall be determined as follows:

/...

$$F = \frac{\text{Gross operating costs - mining (GOCM)}}{\text{Gross operating costs - mining and processing (GOCMP)}}$$

(3) 1. The term "gross operating costs - mining" shall mean:

(i) Operating costs as defined in article 11, but not including operating losses carried forward from prior accounting years;

(ii) Development costs recoverable in accordance with article 12;

(iii) The annual deemed fixed dividend of 15 per cent on the invested capital in the mining sector.

2. The term "gross operating costs - mining and processing" shall mean the gross operating costs-mining as defined above plus the gross operating costs of the processing investment calculated, mutatis mutandis, in accordance with the same principle.

3. The term "market value of the nodules' metal content" shall mean the average price for the processed metals quoted by the respective international terminal market during that accounting period. If no such international terminal market for the processed substances exists, the sales prices obtained by the Investor shall be used, provided, however, that these prices are the result of arm's-length transactions. On request, the Investor will provide all necessary information to the Enterprise to demonstrate that the transactions were carried out at arm's length.

(4) In the first three years of commercial exploitation, gross operating costs - mining will be computed in accordance with the projections agreed to in the general investment plan. The gross operating costs-processing will be computed in accordance with the projections agreed on in the special investment plan as outlined in paragraph 5 below. Beginning with the fourth year of commercial exploitation, the revenue-splitting factor shall be adjusted then and every three years thereafter, taking into account the prior year's actual operating costs, the prior year's depreciation charges and the total amount of invested capital as of the end of the expired three-year period. The deemed rate of return on invested capital shall remain fixed at fifteen per cent (15%) and may be changed only with the unanimous consent of the Enterprise, the Operating Company and the Investor.

(5) For purposes of this calculation, the Investor shall develop a special investment plan for the processing sector containing all items needed for the calculation of the revenue-splitting factor in analogy with the mining sector. In particular, a fixed rate of ten per cent (10%) over a period of ten years for the recovery of development costs and a fixed deemed dividend of fifteen per cent (15%) on all invested capital shall be applied. The special investment plan shall be submitted to the Operating Company's Board of Directors. If three or more members of the Board reject the data contained in the special investment plan, the Board will appoint a firm of consultants qualified to review the projected data. A three-quarters vote of the Board shall be required for the appointment.

/...

(6) If within twelve weeks the Board of Directors fails to appoint a consulting firm, the President of the International Chamber of Commerce shall select the firm, provided always that, if the parties do not agree otherwise, the firm so selected shall not be affiliated with the Investor nor shall it have been in the employ of either the Investor or the Enterprise during the prior two years. If the consulting firm substantially confirms the adequacy of the data in the special investment plan, then the plan shall be binding on the parties in respect of the calculations in this article. If the consulting firm substantially disagrees with the special investment plan, either in total or in substantial parts, then the Investor shall submit an amended special investment plan in accordance with the recommendations of the consulting firm. The amended plan shall then be binding on the parties.

(7) At the end of each month, the Operating Company shall receive an advance payment against the total value of yearly sales, which shall be computed by taking the preceding month's average market value of the nodules' metal content and by multiplying that value by the preceding year's revenue-splitting factor. For determining the monthly value, paragraph 3 shall apply accordingly.

ARTICLE 11

Operating costs

The term "operating costs" shall mean all expenditure incurred after the commencement of commercial production in the mining of the resources of the designated area and the activities related thereto, in conformity with generally-recognized accounting principles in the mining industry, including, inter alia, expenditures for wages, salaries, employee benefits, supplies, materials, services and transportation, including also the service fees payable to the shipping carrier, interest, utilities, preservation of the marine environment, overhead and administrative costs specifically related to the purposes of the Operating Company and any net operating losses carried forward from prior accounting years.

ARTICLE 12

Development costs

(1) The term "development costs" shall mean:

(i) All expenditures incurred prior to the commencement of commercial production which are directly related to the mining of the resources of the designated area and activities related thereto, in conformity with generally recognized accounting principles, including, inter alia, costs of machinery, equipment, ships, buildings, exploration of the designated area, construction, interest, required leases, licenses, fees;

(ii) Similar expenditures, incurred subsequent to the commencement of commercial production, for the replacement, improvement or addition of machinery and equipment.

(2) The proceeds from the disposal of capital assets and the market value of those capital assets which are no longer required for operations and which are not sold shall be deducted from development costs during the relevant accounting year. When these deductions exceed the development costs, the excess shall be added to the gross proceeds.

(3) The development costs referred to in subparagraph (1) (i) shall be recovered in ten equal annual instalments from the date of commencement of commercial production. The development costs referred to in subparagraph (i) (ii) shall be recovered in ten or fewer equal annual instalments so as to ensure their complete recovery by the end of the joint-venture agreement.

ARTICLE 13

Accounting, auditing and currency translation

(1) The books of the Operating Company shall be kept in accordance with generally recognized accounting principles in the mining industry.

(2) At the end of each fiscal year (... definition of the fiscal year), the accounts shall be prepared under the historical cost convention and by the end of the following quarter of the next fiscal year shall be audited by the auditor elected under part C, article 6, paragraph (4), of this agreement.

(3) Monetary assets and liabilities stated in currencies other than the Operating Company's currency agreed upon shall be translated into the Operating Company's currency at rates of exchange pertaining at balance date. Non-monetary items shall be translated at the rate of exchange pertaining at the date of the relevant transaction. Gains and losses from currency translations shall be recognized as they occur with the exception of net unrealized exchange losses on borrowing in a non-Operating Company currency which shall be reflected in an exchange fluctuation account, and shall be recognized at the date of the realization of such losses.

ARTICLE 14

Review and audit for the determination of the revenue-splitting factor

(1) For purposes of examining the accounts and other data which determine the revenue-splitting factor, the Enterprise may ask the Investor to nominate an independent accountant acceptable to the Enterprise. This accountant shall have the right to review and audit the books of the processing firm relating to the capital formation and the operating costs.

(2) On the request of the Enterprise, the accountant shall examine whether the sales prices obtained under part C, article 10, paragraph (3), subparagraph (3), resulted from arm's-length transactions.

(3) On the request of the Enterprise, the accountant shall prepare an opinion of the correctness of the revenue-splitting factor.

(4) The costs of the yearly review and audit in accordance with the foregoing paragraphs shall be borne fully by the Operating Company. If the Enterprise requests an extraordinary review, it shall bear one third of the costs.

ARTICLE 15

Procurement of goods and services

(1) In the procurement of goods and services, the Operating Company will seek the best combination of quality, experience, price and most favourable delivery time. Among equally favourable bids, the Operating Company will always give preference to bids originating in developing countries.

(2) The responsibility for making such selections shall be vested in the Managing Director, but such responsibility shall be exercised reasonably in relation to the standards established by this article. On the request of two Board members, the Managing Director shall produce evidence that these standards were met.

(3) Notwithstanding the preceding paragraphs, the goods and services listed in schedule ______ to this agreement will be procured from the Investor or his affiliates on fair, reasonable and commercial terms.

ARTICLE 16

Transfer of technology: equipment, services and know-how

(1) Throughout the operation, the Investor shall make available to the Operating Company all equipment, technical knowledge and assistance to create, maintain and implement a sea-bed mining operation at the best available standards of technological, logistical, managerial and commercial practice.

(2) If the Investor is not legally entitled to transfer such equipment, patents or know-how, he shall use his best efforts to assist the Operating Company in obtaining such equipment and licences on fair, reasonable and commercial terms.

(3) The individual terms of an agreement concerning the necessary technology transfer to the Operating Company, including inter alia the price of such transfer, the means of protection against proliferation to third parties and the rights of the Investor and the Enterprise to use technologies newly developed within the Operating Company, shall be covered in a special agreement between the Investor, the Operating Company and the Enterprise.

ARTICLE 17

Transfer of tchnology: training by the Operating Company

(1) To promote the transfer of technology and the knowledge necessary to carry out sea-bed mining in favour of the Enterprise, the Operating Company shall provide training opportunities for staff nominated by the Enterprise on all administrative and technical levels of the operation by establishing

(i) An internship programme on a rotating scheme;

(ii) Assistant managerial positions;

(iii) An on-the-job training programme;

(iv) Ten fellowships for attendance at higher educational and vocational institutions.

(2) It is understood that at least ten per cent (10%) of the Operating Company's personnel shall be allowed to participate in the training programme.

(3) The Enterprise will nominate a general training programme supervisor who shall be elected by the Board of Directors immediately after the date of this agreement. The supervisor shall co-ordinate, on an equal footing with the Managing Director, all training questions covered by this paragraph.

(4) Within three months after the appointment of the general training programme supervisor, the general training programme supervisor and the Managing Director shall jointly propose a detailed training plan for approval by the Board of Directors. The first training plan shall cover the exploration period. The second training plan shall cover the period of commercial exploitation and shall be submitted nine months before the commencement of that period.

(5) The training plans shall be reviewed on a biannual basis by the Board of Directors.

ARTICLE 18

Transfer of technology: training by the Investor

(1) Each year, the Investor shall accept ___ trainees nominated by the Enterprise for training in its processing facility, or, before the start-up of the processing facility, in its pilot plant or in related operations which are geared towards the completion of the processing facility, including the relevant research and development departments.

(2) The trainees shall be trained in significant and suitable aspects of the processing sector, including the various engineering, managerial and trade categories involved.

(3) The Investor shall propose to the Enterprise a trainee programme within six (6) months after the date of this agreement.

(4) The trainee programme shall be reviewed on a biannual basis by mutual agreement between the Enterprise and the Investor.

ARTICLE 19

Default and force majeure

(1) In the event of non-performance of obligations under this part of the agreement, the provisions for default and force majeure in part B, article 5, paragraphs (1), (2), (4) and (5), shall apply accordingly.

(2) In the event of default in making a payment of money to the Operating Company, be it a payment agreed upon in this joint-venture agreement or decided upon by the Board of Directors in accordance with article 6 of this part, then the period within which the defaulting party must correct such default shall be ninety (90) days or as may be otherwise agreed upon after the receipt of notice thereof. The penalty for late payment shall be an interest charge on the amount in default for the period from the date the payment was due until actually received, at the rate of ____ (e.g. the New York prime interest rate) in effect at the date of default plus four per cent (4%). This penalty shall be paid in cash to the non-defaulting party.

ARTICLE 20

Dispute settlement

(1) Any differences or disputes arising between the parties, including the Operating Company, which relate to the interpretation and application of this part of the agreement and which cannot be settled amicably shall be settled by arbitration (e.g. UNCITRAL). This procedure of dispute settlement is without prejudice to other procedures of dispute settlement specifically provided for in other articles of this part.

(2) The arbitral tribunal shall consist of three arbitrators. The Investor and the Enterprise shall each appoint one arbitrator. The two arbitrators shall appoint the third arbitrator. If the parties or the arbitrators fail within thirty (30) days to make the necessary appointments, the President of the International Chamber of Commerce in Paris shall be the appointing authority in the sense of the UNCITRAL Arbitration Rules.

ARTICLE 21

Applicable law

The law applicable to this joint-venture agreement shall be the law of ______ (the place of incorporation).

/...

ARTICLE 22

Renegotiation

(1) When circumstances have arisen, or are likely to arise, which would render a clause or clauses of this part of the agreement inequitable or make it impracticable or impossible to achieve the objectives set out herein, the parties to this joint-venture agreement shall enter into negotiations to adjust the clause(s) to the new circumstances. However, renegotiation shall not extend to clauses which relate to the institutional structure contained in this part of the agreement.

(2) If one of the parties to this joint-venture agreement asks for the renegotiation of a clause or clauses and no settlement is reached between the parties, a special renegotiation committee shall be formed consisting of one of the Board members nominated by the Enterprise and one of the Board members nominated by the Investor. Within three months or such time as the Board may determine, this Committee shall make a proposal for approval by the Board of Directors with a majority vote of three quarters of the members of the Board. If the proposal is so approved, both parties will be notified by the Board of Directors to convene a special meeting to ratify or reject the proposed amendment.

(3) If the proposal approved by the Board of Directors is rejected, either party may address themselves to a Board of Conciliators consisting of one conciliator chosen by each party and a third presiding member chosen by the two conciliators. If the two members of the Board of Conciliators cannot reach agreement on the person of the third member, they shall request the President of the Law of the Sea Tribunal to appoint the third member. The Board of Conciliators shall make a report which shall be forwarded to the parties for their consideration. As to the conciliation procedure, the provisions of annex V to the Convention shall apply accordingly.

ARTICLE 23

Termination and assignment

(1) This joint-venture agreement shall be terminated and the Operating Company shall be liquidated at the end of the period of commercial exploitation unless the parties agree otherwise.

(2) This joint-venture agreement in all its rights and obligations shall not be assignable unless the parties agree otherwise.

(3) If the investor should be wound up, or be the object of a reconstruction or amalgamation which affects fundamentally the technological and financial capability of the venture, the Enterprise shall have the option to buy his share in the Operating Company on fair, reasonable and commercial terms.

/...

IN WITNESS WHEREOF, the parties have caused this agreement to be duly executed on the ________________ (date of this agreement) at ___________________________ location)

For the INTERNATIONAL SEA-BED AUTHORITY
By: ________________________

For the ENTERPRISE
By: ________________________

For the INVESTOR
By: ________________________

II. COMMENTS ON THE INDIVIDUAL CLAUSES OF THE DRAFT AGREEMENT

Clauses of part A

Part A, article 1: Grant of rights

This article presupposes that the area covered by the plan of work has already been prospected.

Paragraph (1) is in conformity with the Authority's obligation in annex III, article 16, of the Convention to accord the operator the exclusive right to explore and exploit the area covered by the plan of work.

Part A, article 2: Assignment of rights to the operating company

Paragraph (1) provides for a link between the approval of the plan of work and the formation of the joint company as operating company of the mining venture.

Paragraph (2) is a consequence of the premise that the joint venture will be incorporated (cf. part C art. 1). This provision provides for the possibility of using the mined nodules as security for outstanding debt. The provision reflects annex III, article 1 of the Convention which provides that "title to minerals shall pass upon recovery in accordance with this Convention".

Paragraph (3). The problem of control is addressed by the Convention in article 153, paragraphs 4 and 5.

Also, annex III, article 17, pays attention to further rights of control of the Authority, particularly pertaining to performance requirements, renunciation of areas, submission of data, inspection and supervision of operations and mining standards and practices (operational safety, conservation of the resources and protection of the marine environment).

/...

We have drafted a clause which refers to the regulations of the Convention. However, parties may wish to spell out a complete listing of control rights of the Authority to provide for unforeseen changes in this sector.

Part A, article 3: Exploration period

The date of the commencement of the exploration period should be specified to be in the neighbourhood of three to nine months after the date of the agreement. We have not specified a term for the exploration period or specified mining expenses per square mile of the area because we feel that the parties (through the operating company), in consideration of their financial involvement, will carry out the exploration as quickly and efficiently as possible. An outside deadline might not produce optimal results; the overall completeness of the data collection necessary for the determination required in the feasibility study could suffer. Thus, in contrast to land-based mining, the problem of hoarding of potentially mineral-rich ore bodies does not specifically ask for a remedy.

Paragraph (2). The definition of the data to be collected follows the performance definition in the Battelle/Aachen study. 2/ However, we proceed on the assumption that exploration and exploitatior are not parallel stages but rather are conducted in a sequence in accordance with the assumptions implicit in annex III.

Part A, article 4: Feasibility study and design of operations

The feasibility study aims in two directions. First, it is a means of reaching consent on the question of whether the operation is commercially viable. Second, it provides the Authority with operation design data necessary for the Authority to exercise control. We assume that the feasibility study includes a draft of the general investment Plan as outlined in part C, article 7.

Part A, article 5: Exploitation period

Paragraph (1) states that the investor and the Enterprise have to determine whether they want to go ahead. This determination is not left to the operating company since the investor and the Enterprise - given the tax privilege of the Enterprise - might apply different standards of financial evaluation to the exploration results.

In paragraph (3), the exploitation period is framed in accordance with generally accepted estimates. MIT and Aachen/Battelle assume an exploitation time of 25 years.

As to the production rate, this paragraph presupposes that the yearly production of 3 million tons of nodules remains within the production limits of article 151 of the Convention. However, we have not framed the production limit in terms of the amount of nickel recovered under actual operating conditions, because this might create disincentives to developing technologies for the most efficient processing for nickel from a given quantity of nodules. Advances in technology in this sector are desirable for purposes of maximum recovery. On the other hand, given the incremental nature of productivity gains, they would probably not materially affect the conditions in the nickel market during the term of this Agreement and would not thereby counteract the general policy of production limits.

/...

Paragraph (4) refers to the problem that, during the exploitation phase, technological defects or problems arise which make reaching the contemplated production goal impossible (for example, lower sweep efficiency). If the investor is fully convinced that its technology will produce the contemplated results, this clause is superfluous.

Paragraph (5). The draft provides for a prolongation of the exploitation period in cases of force majeure. However, we understand that production interruptions already contemplated in the feasibility study and the general investment plan are not covered by this paragraph.

Part A, article 6: Benefits to developing countries

Article 6 refers to the general objective of the Convention to promote benefits to developing countries (arts. 148, 152, para. 2, and annex III, art. 15).

These objectives are also recognized through the right of the Enterprise to commission trainees (part C, arts. 17 and 18 of this Agreement) and the preferential treatment given to bids submitted by suppliers from developing nations through the operating company (part C, art. 15 of this Agreement).

We have not inserted a clause to encourage the construction of a processing facility in a developing country, but we think that this point might be scrutinized in the negotiations. In this regard, it is important to note that a production facility requires high infrastructural costs including a fully fledged power plant or a high potential for power supply. Experts express differing opinions on development effects as to whether enclave projects produce sufficient transfers to developing nations. For the investor, the economic parameters of a decision are the costs of transportation to the processing facility, labour costs, costs of infrastructure and power supply, costs of environmental protection and possible legal barriers to establishing an investor-financed processing facility in the developing country. In some instances the question arises whether a host-country majority would be required for this type of investment. If the costs of establishing a processing plant in a developing country are higher than in industrial countries, the Authority must consider whether to grant financial incentives to facilitate the construction in a developing country. However, it is a problem of distributional justice whether a particular developing country should enjoy additional benefits at the expense of the general revenue of the Authority intended to be distributed as a part of the common heritage of mankind.

Part A, article 7: Reports, documents and other data

This article refers to annex III, article 14, in which any operator is required to

> "transfer ... all data which are both necessary for and relevant to the effective exercise of the powers and functions of the principal organs of the Authority in respect of the area covered by the plan of work".

/...

We assume that a restatement of paragraphs 2 and 3 of annex III, article 14, of the Convention concerning confidentiality and non-disclosure is unnecessary because the Authority is bound to act in accordance with the Convention.

Clauses of part B

Article 1: Transfer of technology

In accordance with the considerations put forward in the introduction to the model agreement the investor undertakes to make available to the operating company the technology used in regard to the designated area. The investor's obligations are spelled out in detail in the special clauses on the transfer of technology (part C, arts. 16-18 of this Agreement).

Article 2: Fiscal obligations

In paragraph (1) we follow the approach developed in the Convention concerning the tax liability of the joint-venture partner (annex III, art. 11, para. 3). Thus, the operating company is exempt from any tax liability vis-à-vis the Authority. The tax liability rests instead with the investor as to his joint-venture share. We have included a provision exempting the investor from his tax liability in the event that he does not receive his share of the net proceeds from the operating company on time. In calculating the tax base we assume that the investment costs for the mining sector are above the 25 per cent minimum which are provided in the Convention in the case of a contract for an integrated operation (annex III, art. 13, para. 6 (e)). This assumption seems to be realistic if transportation is not covered by a separate capital investment but rather with a service contract within the cost structure of the mining sector. In that case mining will probably produce more than 25 per cent of the total costs. If these assumptions do not materialize, the fiscal régime would have to be adjusted. As to the fiscal scheme, this article utilizes the scheme developed in annex III, article 13 of the Convention.

The fiscal provisions in this article must be read in conjunction with the revenue-splitting scheme provided for in part C, article 10.

In determining the tax level, the following factors should be considered:

(a) The costs incurred by the operating company for the training of personnel (cf. part C, art. 17) will diminish the operating company's net proceeds by a substantial sum, thus also diminishing the investor's profit share. We understand that annex III, article 5 does not foresee such training free of charge if the Investor is a contractor;

(b) In part C, article 18 the investor assumes an additional training obligation in his processing facility free of charge.

We assume that the annual fixed fee should be waived. In the light of the possibility of deducting this fee from taxable income, the fee has a practical effect only during the exploration period.

We have inserted paragraph (8) to make it clear that all matters of construction shall be considered in the light of article 13 of annex III to ensure a parallel treatment of contractors and investors in a joint venture.

Article 3: Control by the Authority

This article corresponds to part A, article 7. Since we assume that the investor will be involved in commercial transactions with the operating company, the Authority and the investor have to agree on special monitoring rights with respect to these transactions. The problem of arm's-length transactions is dealt with in the general manner outlined in annex III, article 13, paragraph 9, of the Convention. The Authority is given the power of final determination of an adequate price in accordance with general pricing principles.

Paragraph (3) restates annex III, article 13, paragraph 12, of the Convention.

Article 4: Security of tenure

This article is of particular importance to the investor. It restates the same rights as are given to a contractor in the non-reserved area. The consent requirements are tuned to the needs of the partners of the joint-venture agreement including the operating company.

Article 19 of annex III reads:

> "Revision of contract
>
> "1. When circumstances have arisen or are likely to arise which, in the opinion of either party, would render the contract inequitable or make it impracticable or make it impossible to achieve the objectives set out in the contract or in Part XI, the parties shall enter into negotiations to revise it accordingly.
>
> "2. Any contract entered into in accordance with article 153, paragraph 3, may be revised only with the consent of the parties."

The revision clause should be read in conjunction with the contract revision clause in this agreement (part C, art. 22, para. (1)).

Article 5: Default and force majeure

The following contingencies might be of practical importance for this clause:

(a) Affecting the investor:

(i) transfer of technology;

(ii) submission of reports and data;

(b) Affecting the Authority:

(i) guarantee of the exclusive right to mine the area.

/...

At the same time, paragraph (3) renders the Authority liable for omissions of its organs or employees. Paragraph (4) will come into play only if the delay or the curtailment leads to failure to achieve the yearly production goal specified in the general investment plan. For example, delays which do not reduce the number of working days on the sea foreseen in the plan do not lead to an extension. This clause is to be read in conjunction with part A, article 5, paragraph (5).

Paragraph (5) is drafted along the lines of standard clauses contained in recent land-based mining agreements.

Paragraph (6) provides for a special monetary penalty if the investor is in default in making any payment of money to the Authority.

Article 6: Termination

Paragraph (1) refers to the problem that the investor incurs losses during the period of commercial exploitation. The contractor may withdraw at any time under a contract in accordance with annex III, article 17, paragraph 2, subparagraph (e). Therefore, giving the investor a right to withdraw from the joint venture seems justified. However, in view of the special situation in a joint venture, e.g. the fact that the other partner has also committed substantial funds to the project and will be severely affected by a withdrawal, a protection mechanism has to be employed. We suggest a two-fold mechanism. First, the investor must have incurred losses over a period of time. Second, he must give notice of withdrawal before he withdraws from the project. The notice of withdrawal gives the Authority the possibility of reconsidering the fiscal terms of the agreement. In practice, the withdrawal procedure will be the ultimate resort in case of the total failure of the operation. In the light of the fact that the investor has committed substantial funds to the project and has also invested in the processing sector, a withdrawal seems to be unlikely. The clause is meant as a special renegotiation clause in cases of hardship.

Article 7: Dispute settlement

In drafting this article we have recognized the interest of the Authority and the Enterprise in having the special conflict resolution mechanisms of the Convention applied to matters covered by the Convention. Paragraph (1) follows the wording of article 187, paragraph (c), (i) and (ii), of the Convention; it adds the words: "including interests in the Operating Company established under part C". Paragraphs (2) and (3) correspond to article 188, paragraph (2), (a) to (c), of the Convention.

Article 8: Applicable law

This provision is in accordance with annex III article 21. The provision may eventually be in conflict with the security of tenure clause (part B, art. 4). The investor may wish to elaborate the term "rules and regulations prescribed by the Authority" to exclude new rules and regulations which conflict with the joint-venture agreement.

/...

Clauses of part C

Article 1: Formation of a joint company

We suggest proceeding with an incorporated operating company. Incorporation is particularly demanded by the inherent risks of the operation. Neither the Investor nor the Enterprise (or Authority) will want to assume unlimited liability for all acts and omissions of the operating company. Tax reasons (e.g. the United States depletion allowance) might argue against incorporation. A compromise has to be struck in any particular case. In view of the privileges and immunities of the Enterprise, incorporation in a State which is a party to the Convention will probably be preferred.

Article 2: Principal office

The place of the principal office should preferably be at the place of incorporation in order to avoid the impact of different national laws. There are also reasons for placing the principal office in the vicinity of the mining operation.

The place of incorporation may influence the law applicable to the joint venture agreement (part C, article 21).

Article 3: Capital proportion

We recommend a genuinely symmetrical equity participation in the operating company to reflect the idea of partnership on an equal footing. Symbolic forms of participation, as occur in land-based mining in a number of developing countries, are mainly parts of the fiscal terms of mining agreements and need not be imitated in the present case. The Enterprise is likely to possess adequate financing capacities (cf. annex IV., art. 11, para. 3, of the Convention) to raise a major part of the equity. the return on invested capital on the Enterprise's side is likely to be rewarding since the Investor will enter into the Operating Company only if he determines that the project - after taxes - will yield an adequate commercial rate of return for the invested risk capital. From our experience in land-based mining the Investor will probably not accept a minority capital part in the operation unless he can enter into a rewarding position analogous to a service contract. On the other hand, it is likely that the Enterprise will not accept a minority position in an operation concerning the reserved area because it would thereby accept a "quasi-contract" and thus undermine the parallel system in favour of private investors (contractors).

It is conceivable that the Enterprise might buy the technology through a service contract as is common in petroleum mining and in rare instances of hard-mineral mining (in respect of new projects). However, from the evidence in the hard mineral sector, such engagements tend to be rather costly for the partner asking for the services of starting-up and managing the operation. Especially in the case of new technologies, the involvement of the technology producer and owner by including him in the risks and rewards of the joint arrangement is likely to maximize the overall efficiency and constant implementation of the mining project.

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Phase-in and phase-out of equity - according to experience in land-based mining - discriminates against the "favoured" partner because disinvestment in a current operation is likely to be accompanied by an increasing disinterest in the performance of the project.

Article 4: Initial capital

Our assumptions about the capital required are taken from the Aachen/Battelle study. To avoid the delicate negotiation problem of the valuation of the prospected area and the contributions through rendering research and development and other development costs of sea-bed mining technology, we have inserted a clause which excludes these items from the initial capital valuation. Past expenses for research and development on the Investor's side will be considered in his fiscal liability to the Authority (part B, article 2). It would be unwise to make an initial valuation of the mining site or the manganese nodules in situ because these valuations are likely to change with the market prices of the processed metals. This value finds its expression in the proceeds of the operating company.

Article 5: Financing, commerical exploitation

The assumptions about capital requirements are taken from the Aachen/Battelle study. We assume a debt/equity ratio of 1 : 1. We implicitly assume that the operating company does not have a high borrowing capacity.

Commercial lenders are likely to ask for security in the form of liens on the equipment of the operating company. For that purpose a "safe" flag is likely to reduce the rate of interest.

Article 6: Board of Directors

With the aim of securing equal voting power for each side, we have adopted the smallest workable board composition; it allows for

(a) A working team of three directors elected by each party;

(b) A tie-breaking vote through a further member of the Board elected by both parties to ensure the functioning of the Board and to increase the expertise of this body.

The seventh member is expected to be an integrating factor in the decision-making of the Board and of either party. This solution seems to be preferable to a double vote by a chairman elected alternately by each side. We assume that the seventh member will represent the common aims of both parties in the undertaking. The biannual term safeguards against voting biased for either side.

The powers of the Board described in paragraph (4) will allow the operating company some autonomy and flexibility vis-à-vis the sponsoring parties.

The Investor, the Enterprise and the operating company are bound to operate within the range of the general investment plan.

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Article 7: General investment plan

Looking at successful instances of recent land-based mining agreements, we find that a shared knowledge of the techniques and assumptions for making the investment decision is an important factor for establishing mutual confidence of the parties involved in the negotiating process. The commomly employed techniques of discounted cash flow analysis and analysis of the internal rate of return on the investments should be commonly and overtly employed by the parties to define their range of expectations. If the assumptions and expectations are incorporated in a written document, either party can demonstrate whether or not the set of assumptions has fundamentally changed. In the long run this will ensure the stability of the co-operation and the efficiency of the project. The general investment plan is a normative pattern which is binding upon all parties to the agreement and the operating company. However, the plan will allow for sufficient flexibility in the conduct of operations.

Article 8: Managing Director

The Managing Director is responsible for the day-to-day management of operations. From experience in land-based mining, an optimal transfer of technology in the initial phase of a project can best be channelled by staffing central management positions, particularly those relating to the technical sector, with experienced personnel from the technology-owning side.

We have therefore given the Investor the power to determine the Managing Director for the first 10 years. The investor's recommendation to the Board of Directors to elect or recall the Managing Director is binding. The practical shift of controlling powers through the investor's right to determine the Managing Director is hedged by the monitoring powers of the Board of Directors, by the general investment plan and by the time-limit on the right of recommendation. The Managing Director must show a large degree of independence because he can conduct the day-to-day operations smoothly only if he is capable of reaching compromises on issues on which the Enterprise and the Investor may have different views.

With regard to the important sector of training within the operating company, the Managing Director stands on an equal footing with the general training programme supervisor who is nominated by the Enterprise.

Article 9: Distribution of net profits

The distribution of net profits follows the ordinary lines established in a 50 : 50 joint venture in a commercial setting.

Article 10: Sale and pricing of nodules - revenue-splitting scheme

This article is at the core of a joint venture limited to mining (including shipping by a service contract). It takes account of the following technical and economic premises:

(a) The chemical composition of the nodules in the various sites of the Pacific, and even in the Clarion-Clipperton fracture zone, is significantly

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different. This difference means that processing has to be adjusted to the characteristics of the particular mine site;

(b) The project is one of the first under the régime of the Convention. No processing facilities suitable for the mined nodules yet exist.

Therefore it seems to be realistic to expect processing to be undertaken by the technology-owning investor who is also the joint-venture partner of the Enterprise. Given the specific properties of unprocessed nodules, they are presently not a commodity which could be the object of market transactions. As a consequence, a method has to be developed which serves to allocate the resulting value between the mining and processing sectors of the operation.

For purposes of the distribution of the gross revenue between the mining and the processing sectors of a hypothetical "integrated operation" we have adopted the so-called gross operating cost-based revenue-splitting model.

In this model we add operating costs and deemed capital costs at a fixed interest rate and define the sum as the deemed gross operating costs. After this calculation has been made for both the mining and the processing sector, the respective amount of these costs determines the revenue-splitting factor. Each sector will then receive that amount of the sales revenues that corresponds to its share of deemded gross operating costs. This approach rests on the premise that each sector should receive not only reimbursement for the operating costs incurred, but also a certain annual return on investment capital.

The revenue-splitting factor remains fixed for a three-year period. During this period no real costs enter into the calculus but projected costs and a fixed rate of return on capital are used. By using this device, each sector feels an economic incentive to reduce costs on both the operating and capital cost sides. The comparative advantage of one sector is adjusted in a step-wise procedure. In sum, either sector enjoys a certain temporary leeway by which it may produce extra gains by rationalizing the operation, or simply receiving windfall gains through lower opportunity costs of auxiliary goods and services. Too quick an adjustment of the revenue-splitting factor would be a disincentive to optimize the individual operations. If the terms remained fixed over a very long period, the revenue splitting would become inequitable. We think that an adjustment every third year creates sufficient incentives to ensure a return on rationalization investment but also does justice to the interest of the other side in receiving an equitable share of the total proceeds. A critical period in our model is the third year which serves as the base for calculating the new revenue-splitting factor. Here, both mining and processing sectors may try to raise their costs to enjoy the better factor which would result. However, since the costs will largely be used for new productive investment, the efficiency of the overall operation might be increased in the following years with resulting benefits.

When commercial production is started, the initial calculation of the revenue-splitting factor will be based on the projections contained in the general investment plan (which is assented to by the Enterprise and the investor) in the mining sector, and a special investment plan which has to be proposed by the

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investor for the processing sector under control of an independent consulting firm. In proposing this solution, we have taken account of the investor's interest not to be subjected to the total supervision and control of the Enterprise in a commercial undertaking outside the reach of the Convention. We have thus set forth detailed procedural rules by which the conflicting interests of the Enterprise (Authority) and the investor are resolvable. If the parties cannot agree on a mutually acceptable consulting firm, the final decision will be made by an umpire. We have suggested the President of the International Chamber of Commerce as the umpire but we could also think of the President of the Law of the Sea Tribunal or the President of the Sea-Bed Disputes Chamber. The latter has been chosen, for example, for the nomination of members of the ad hoc chambers of the Sea-Bed Disputes Chamber (annex VI, art. 36, para. 2) of the Convention.

Our draft further provides that, in the case of disagreement between the special investment plan and the calculations of the consulting firm, the latter's judgement is preferable. As unlikely as such disagreements may be, the Investor must be prepared to tolerate for an initial period of three years the fact that his own projections may deviate from those established by the independent consultant. Such a deviation would not result in an option to withdraw. An option to withdraw would be impracticable in any event because, at the date of the establishment of the first revenue-splitting factor, the Investor will have invested such a formidable amount in the processing plant that unilateral action would result in prohibitive losses.

Article 11: Operating costs

This Article basically restates the definition of operating costs in annex III, article 13, paragraph 6, subparagraphs (k) and (n) (v) of the Convention.

Article 12: Development costs

The definition of development costs draws on the definition of annex III, article 13, paragraph 6, subparagraphs (k) and (n) (iv) of the Convention adjusted to the specific situation of the Agreement:

(a) It does not cover research and development expenses, since these are taken into account in part B, article 2;

(b) It does not cover prospecting costs, because the Investor has not spent any money on this item as the Enterprise has brought in an already prospected area. To include this item here would mean letting the investor participate in savings available to the Enterprise in the form of the parallel system.

In paragraph (3) we have adhered to the way the Convention allows the recovery of development costs, although depreciation rates for different capital items usually vary according to the expected lifetime of the item. The Convention's solution offers the advantage of administrative simplicity.

Article 13: Accounting, auditing, and currency translation

We feel that accounting policies should be stated in the joint-venture agreement to avoid unnecessary disputes on that point. The policy of preparing the account under the historical cost convention takes account of the fact that the whole project design and the general investment plan have necessarily to use cost items as they appear at the date of entry. This clause does not prejudice the adjustment provision concerning fiscal obligations in annex III, article 13, paragraph 13, of the Convention. But in part B, article 2, paragraph (4), the adjustment clause is incorporated for purposes of calculating the Investor's fiscal obligations.

Article 14: Review and audit for the determination of the revenue-splitting factor

The Enterprise must have rights of review and audit with regard to the processing sector. The fair and unbiased implementation of the revenue-splitting scheme must be guaranteed. The Investor is not burdened more than he would be had he chosen to conduct an integrated mining and processing operation as a contractor. In that case he would also be obliged to open his books for examination by the Authroity, since both the production charge and the Authority's share of attributable net proceeds would be assessed on the basis of the processing sector. Under annex III, article 13, paragraph 8, of the Convention, the Authority would review the Contractor's sales transactions and the adequacy of the sales prices.

The procedure for nomination of the accountant is the same as envisaged in annex III, article 13, paragrraph 9, subparagraph (b), of the Convention. The investor nominates the accountant, but the Enterprise has the right to veto the investor's choice.

Article 15: Procurement of goods and services

The general principle for procurement of goods and services is in accordance with annex IV, article 12, paragraph 3, where the guidelines for the conduct of operations by the Enterprise are laid out.

Also, this article is in accordance with the rules common in land-based mining agreements where preference is given to goods and services from local sources, to the extent that such goods are available in competitive quality and price.

To ensure application of commercial criteria in the selection, the Managing Director is entrusted with the responsibility of making the selection. This authority is limited only by part C, article 8, paragraph (2) (iii). The Board of Directors will have the power to decide on the subject if the value of the goods and services to be procured exceeds the amount of __________.

Articles 16 to 18: Transfer of technology

These three articles concern the transfer of technology, which is a point of special importance to the functioning of the operating company. The reasons for the suggested solution are indicated in paragraphs 11 to 13 of the introducton to this model agreement. Article 16 contains the contractual obligation of the Investor to provide the operating company with the necessary technology.

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Paragraph (1) states the general obligation of the investor to be active throughout the time of the joint venture.

Paragraph (2) emphasizes that the investor has the duty to assist the operating company in obtaining technologies which are not within the domain of the investor. We assume that the investor as a transnational corporation has a well-developed capacity to acquire such rights at favourable terms, and has means to monitor and enforce such transfers in an optimal way.

In paragraph (3) we have added an open-ended clause because we are aware that the complexities of a technology transfer agreement could not be comprehensively and adequately covered within the tripartite agreement. Further, the obligations of this agreement concern the investor and the operating company. Lastly, the full details of the technology transfer contemplated should be available for the draftsmen of such a special agreement.

Article 17 provides that the main training opportunities are allocated within the operating company. The Enterprise has the right to nominate trainees on all levels, which means, in practice, that the Enterprise is able to safeguard the training interests of the Authority and of developing countries embodied in annex III, article 13, paragraph 1 (d).

We have fixed the number of personnel to be trained at 10 per cent of the operating company's personnel. Of course, this figure must be scrutinized once the parameters for the actual size and organization of the operating company become apparent.

We have created the position of a general training programme supervisor in analogy to the practice in land-based mining to staff the position of the Personnel Manager by a host State national within the framework of the localization policies. We follow the principle that an interest accomodation can be reached through co-operation between the Managing Director and the general training programme supervisor on an equal footing.

The institution of a training plan entails the use of intelligible criteria to establish training requirements, procedures for selection and educational principles, and thus creates programme stability and overall programme efficiency.

With regard to Article 18, the investor's obligation to train personnel nominated by the Enterprise in the processing facility goes beyond the obligation to transfer technology contemplated by the Convention. It seems fair that a certain amount of discretion is left to the investor as to how the training will be conducted. However, the Trainee Programme which is proposed by the investor will provide for a sufficiently stable pattern of training opportunities. We work on the assumption that the problems arising from the training opportunities should be dealt with in privacy between the original contractual parties, namely the Enterprise and the investor.

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Article 19: Default and force majeure

This clause is basically indentical with part B, article 5, in consideration of the special relation between the joint-venture partners. The clause concerning delayed payments is geared towards the problems of capital contributions of the parties, of payments of the investor to the operating company under part C, article 10, paragraph (7), and of the distribution of net profits under part C, article 9. The time-limits are drafted more liberally than in the case of late payments to the Authority.

Article 20: Dispute settlement

The joint venture agreement is not per se subject to the jurisdiction of a dispute-settling body created by the Convention. We propose to use the same arbitration mechanism which the Convention provides for disputes between parties to a contract within the meaning of article 153, paragraph 3 of the Convention, i.e. the UNCITRAL Arbitration Rules. We feel that the joint-venture partners should try to reach agreement in advance on the procedure for appointing the arbitrators. In the event that the parties or the arbitrators fail to make the necessary appointments, we submit that the President of the International Chamber of Commerce would be an appropriate appointing authority.

Article 21: Applicable law

This article should be read in conjunction with part C, article 2.

Article 22: Renegotiation

Paragraph (1) refers to annex III, article 19 (cf. commentary to part B, art. 4). It should be noted that a joint venture agreement may be revised only by mutual consent of the parties (annex III, art. 11, para. 1 and art. 19, para. 2).

In paragraphs (2) and (3) the problem of conflict resolution is channelled through a double filter:

First, provision is made for an internal adjustment procedure whereby a thoroughly informed and small body of two persons, a special renegotiation committee, is given the task of preparing a proposal for renegotiation. Should the proposal not be accepted by a qualified majority of the Board of Directors, then it is clear that there is no likelihood for consensus of the parties and the procedure is automatically terminated. If the proposal is accepted by the Board, each party retains the option to reject the revision.

Second, outside conciliation may be sought if the proposal of the renegotiation committee has been accepted by the Board of Directors, but has been subsequently rejected by one party. The Board of Conciliators cannot bind the parties to its own proposals, but it is assumed that the conciliation report will have a strong persuasive effect. The mere option of exposing an internal problem to a conciliation panel with a neutral presiding member will exercise some pressure on a party which unreasonably withholds consent to an appropriate renegotiation proposal. Besides the renegotiation procedure established in this article, the parties are, of course, free to alter the agreement by mutual consent.

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Article 23: Termination and assignment

Paragraph (1) states the general rule. Of course, the parties may agree to continue the operating company either by adopting a new or amended plan of work or by adopting different objectives for the operating company.

Paragraph (2). In the light of the magnitude and technology-relatedness of the investment and the special joint-venture relations, assignment of shares in the operating company without consent of the partner seems to be inappropriate.

Paragraph (3) states the option to take over the partner's share in case the partner ceases to exist. For example, in the case of the investor, a commercial failure or a substantial reorganization must be contemplated.

Notes

1/ Jaenicke, Schanze and Hauser, A Joint Venture Agreement for Seabed Mining, Studies in Transnational Law of Natural Resources, vol. 5, Kluwer-Deventer (Netherlands) 1981.

2/ "Analysis of the MIT study on deep ocean mining; critical remarks on technology and cost estimates", Technische Hochschule Aachen/Battelle Institute, Frankfurt, 1979.

Annex

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LOS/PCN/SCN.2/WP.5/Corr.2
9 January 1985

ENGLISH ONLY

PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEA-BED AUTHORITY
AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2

A MODEL JOINT VENTURE AGREEMENT FOR SEA-BED MINING

Submitted by the delegation of the Federal Republic of Germany

Corrigendum

Page 7, paragraph 16, line 4

For and 15, *read* and 13,

Page 14, article 2, last paragraph, line 4

For subparagraphs (7) and (8), *read* subparagraphs (a) and (b),

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LOS/PCN/SCN.2/WP.6
5 February 1985

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2

PROJECT PROFILE OF A DEEP SEA-BED MINING OPERATION BY THE ENTERPRISE

Working paper prepared by the Secretariat

Summary

1. This project profile of a deep sea-bed mining operation by the Enterprise has been prepared in response to the request of the Preparatory Commission. It is to be used for illustrative purposes rather than as a basis for definitive decision-making, for which further studies elaborating the various aspects of the project would be required. The object of this paper is to assist the Preparatory Commission in focusing more concretely on the various aspects of developing a deep sea-bed mining project. The main thrust of the paper lies in the illustration of the various operational options available to the Enterprise, the sequential flow of funds and manpower requirements for different operating options.

2. It needs to be noted, however, that the financial and manpower requirements (including their sequencing) are subject to a large number of uncertainties. The coming into force of the Convention is dependent on the rate at which States ratify or accede to it. For the purpose of illustration, the year 1990 is assumed in this paper as the date for the coming into force of the Convention. Later activities like designing of the system, testing its component parts, etc. are contingent on reserves being proven, the requisite technology being acquired and the likely future state of metal markets and prices. Furthermore, the figures assumed for the manpower, revenues, capital and operating parameters of the Enterprise could in actuality vary considerably in either direction based as they are on a literature survey. The figures emerging from the papers should, therefore, be treated as likely happenings under certain circumstances rather than as firm estimates of what might actually happen in the future. Their present value is for the ranking of alternative options under given assumptions rather than as facilitating a go-ahead decision for investment purposes.

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3. One of the underlying assumptions of the project profile is the perceived economic viability of the deep sea-bed mining industry. From this flows the possibility of the Enterprise's operations being financially viable. A number of other assumptions are also detailed in paragraph 20 of this paper but assumptions regarding proven reserves, the acquisition of economically efficient technology and the future of the metal markets are likely to prove crucial to the economic and financial viability of the Enterprise.

4. In addition to the above assumptions, the flow of events detailed in the planning sequence would be dependent on the pace of activities of pioneer investors and developments in the deep sea-bed mining industry. Considerable work on feasibility studies and detailed project reports would, therefore, be necessary before the various planning stages, and the years in which they are likely to occur, can be firmed up. There are numerous available options. These however have been reduced to a few significant ones to enable a quick comparison.

5. Subject to the above caveats, the project profile financially ranks the leasing options, and a service contract for the entire operation, as being the best. The sole operator option and the service contracts for the at-sea activities rank in the middle while the joint venture options and production-sharing arrangements on a 50:50 basis for the mining alone rank last. From the manpower point of view, however, the joint venture options rank the best with the sole operator and leased options ranking last.

6. The project profile also explores the order of equity investment likely to be required. In case the cash flow is as favourable as in the model, requirements would vary from a low of $150 million (in 1980 prices) to a high of $400 million (1980 prices) depending on the operating option chosen.

7. The types of manpower likely to be required by the Enterprise, and its possible sources of recruitment, are detailed in document LOS/PCN/SCN.2/WP.7 entitled "Development of an ad hoc expert core group for the Enterprise to assist the Preparatory Commission". Another paper (LOS/PCN/SCN.2/WP.8) entitled "Training needs and requirements of the Enterprise" suggests that the high and low values of the numbers requiring to be trained are as follows:

	High	Low
Management staff	8-10	4
Processing engineers	24	10
Mining engineers	24	10
Scientists	11	4

It needs to be noted, however, that as stated in annex II of working paper 2 the above figures are capable of varying from -40 per cent to +100 per cent.

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Introduction

8. To enable a thorough examination of the operational options available to the Enterprise, Special Commission 2 requested the Secretariat to develop, on the basis of the information available to it, a complete project profile for the Enterprise. This would require the project profile to concern itself with the exploration and exploitation of a possible mine site, the transportation, processing and marketing of the minerals recovered therefrom as well as with possible operational options and their impact on the main parameters of the project profile.

9. There are, however, some difficulties in undertaking such a task. For one thing there is no actual mining operation in existence. Besides, a project profile is concerned with cash flows and manpower requirements through time. Financial and manpower requirements are subject to a large degree of uncertainty while their sequencing is dependent on the likely date when the Convention comes into force. Although in this paper certain assumptions are made regarding the date when the Convention comes into force, and the rates at which finance and manpower flows take place, it needs to be noted that in actual fact the assumed manpower, revenues, capital and operating parameters of the Enterprise could vary considerably. The figures emerging from the paper are, therefore, better regarded as suggestive of likely happenings than as firm estimates of what will happen in the future.

10. In the absence of any actual mining operation, the figures for capital and operating expenses have been based on assumptions contained in readily available studies on the subject. An underlying assumption is the likelihood of deep sea-bed mining being economically viable while the number of operational options considered has been reduced to a few important ones, thereby facilitating a quick comparative analysis. It needs to be kept in mind, however, that all results are at this stage highly tentative and that considerable work on feasibility studies and detailed project reports would be necessary before the results can be firmed up. The present paper is meant to facilitate concrete discussion on various aspects rather than serve as a basis for a final go-ahead decision on investments. This study should, therefore, be regarded as a first step towards a series of more detailed studies.

A. Feasibility analysis

11. A project profile, or project feasibility analysis as it is more commonly called, typically concerns itself with the assured availability of adequate raw materials, the technological feasibility of the proposed project, the availability of manpower of the right kind and skills, the existence of an adequate market for the products, the availability of local services vital for the project, like power, harbour and transport facilities, water supply, etc., and the overall order of costs likely to be incurred for plant, equipment, labour and raw material inputs. Most importantly, the analysis also sets out to determine whether projected income will exceed likely costs by a margin sufficient to make the project viable.

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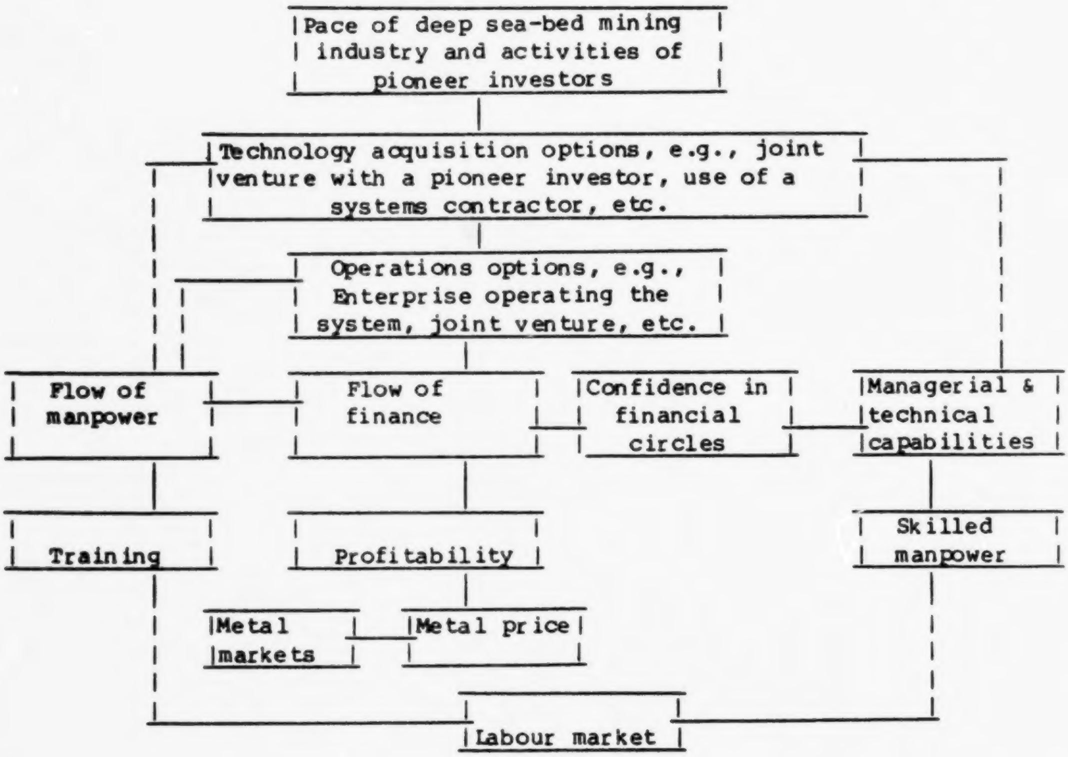
12. There is some difficulty in preparing a typical project profile in the case of a deep sea-bed mining project. Since the Enterprise is getting a prospected site it is dependent on the data made available to it. The position regarding raw material availability and grade thus will only be known after the pioneer investors have been registered and sites designated to be reserved for the Enterprise. Besides, the economic efficiency of the project is dependent on the technology used by the Enterprise. This is, among other things, dependent on the pace of activities of pioneer investors and developments in the deep sea-bed mining industry which would influence the technology acquisition strategy of the Enterprise. Knowledge of the technology acquisition strategy of the Enterprise is therefore a necessary pre-condition for working out the project economics. The likely availability of local services like harbour facilities, power plant, etc. would also only be known after the site for the processing plant has been finalized. Other uncertainties in the project parameters are created by the non-existence of any actual mining operation and the need to project crucial matters like demand and prices of metals far into the future.

13. It also needs to be noted that any choice exercised by the Enterprise in the domains of operations, technology, capital structure, training of manpower, etc. has two-way impacts on other choices. For example, the operational options of the Enterprise are dependent on many factors external to the project like the pace of development of the deep sea-bed mining industry and the speed at which pioneer investors develop their projects: the faster the rate of development, the more the need for the Enterprise going in for the development of operational rather than design and planning skills; while the slower the pace, the greater is the Enterprise's opportunity for developing its designing and planning skills. Endogenously the operational options impact on, and are impacted by, the flow of manpower and finance. Similarly the Enterprise's technology acquisition option is determined to a large degree by the flow of manpower and the existence of managerial and technical skills in the Enterprise. The flow of funds is dependent on the position likely to prevail in metal markets during the life of the project as well as on the confidence that financing circles have in the managerial and technical capabilities of the Enterprise. This study does not distinguish between the first mine site, for which funding may be provided or guaranteed by States parties, and subsequent mine sites developed by the Enterprise. The labour market would determine to a large extent the flow of skilled high technology manpower which is also, however, dependent on the flow of funds and the technology and operational options. The interaction can be depicted as in figure I below:

/...

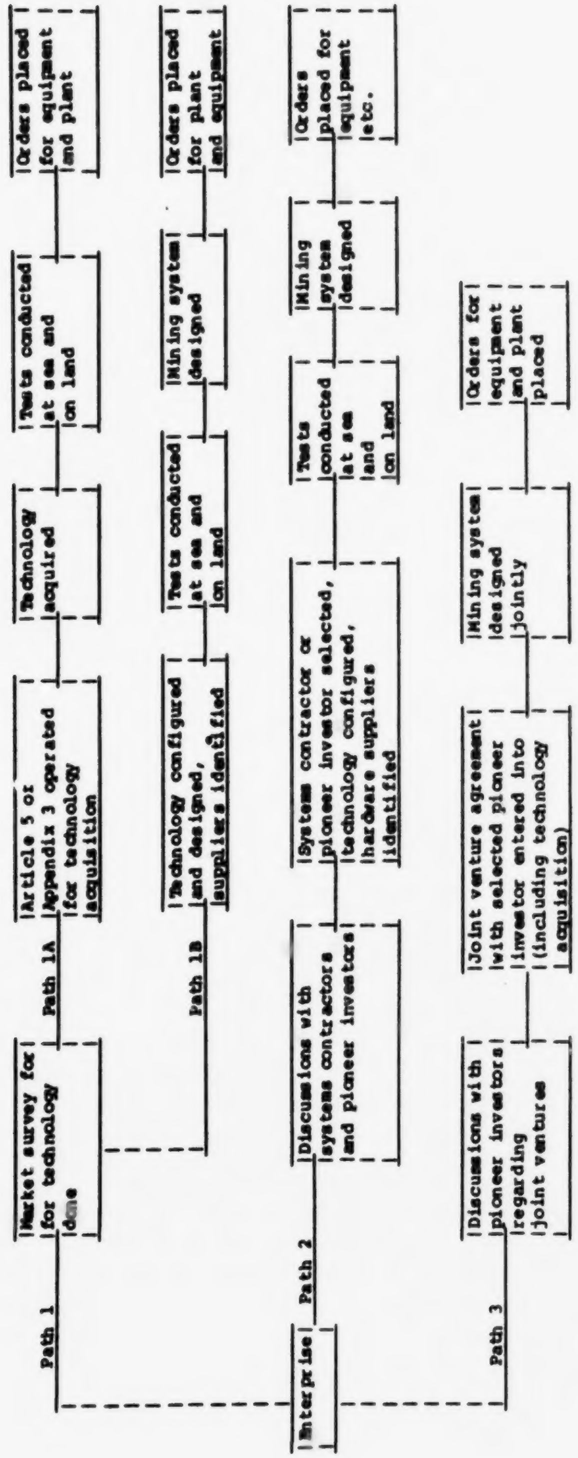
Figure I


Pace of deep sea-bed mining industry and activities of pioneer investors
Technology acquisition options, e.g., joint venture with a pioneer investor, use of a systems contractor, etc.
Operations options, e.g., Enterprise operating the system, joint venture, etc.
Flow of manpower
Flow of finance
Confidence in financial circles
Managerial & technical capabilities
Training
Profitability
Skilled manpower
Metal markets
Metal price
Labour market

14. As is clear from the above figure, the interlinking of the operational, technological, financial and manpower strategies makes for a continuing and dynamic policy flux. In such a state of affairs, a project profile at this stage can at best be regarded as the first step towards a series of more detailed exercises to be undertaken in the future.

15. The selected operating arrangement impacts on the flow of capital in a direct and immediate manner while its impact on manpower flows is somewhat more complex and indirect. If the operating strategy, for example, provides for an equity joint venture, capital requirements are reduced by the extent of equity participation by the partner while if the equipment and plant is leased, then only working capital requirements have to be catered for. In its impact on manpower requirements, the selected operational option has to react with the technology acquisition arrangements. A possible decision path for technology acquisition could be as in figure II.

Figure II


Enterprise
Path 1
Market survey for technology done
Path 1A
Article 5 or Appendix 3 operated for technology acquisition
Technology acquired
Tests conducted at sea and on land
Orders placed for equipment and plant
Path 1B
Technology configured and designed, suppliers identified
Tests conducted at sea and on land
Mining system designed
Orders placed for plant and equipment
Path 2
Discussions with systems contractors and pioneer investors
Systems contractor or pioneer investor selected, technology configured, hardware suppliers identified
Tests conducted at sea and on land
Mining system designed
Orders placed for equipment etc.
Path 3
Discussions with pioneer investors regarding joint ventures
Joint venture agreement with selected pioneer investor entered into (including technology acquisition)
Mining system designed jointly
Orders for equipment and plant placed

/...

16. The manpower requirements, as they affect design and planning personnel, would quite obviously vary in the above four paths. The requirements would be greatest in path 1-B and least in paths 3 and 1-A. They would be somewhere in between in path 2.

B. Project profile

17. The interaction between policies relating to technology, capital funding, manpower development, and marketing produces a host of possible operating arrangements. With respect to technology we have already noted some of the available options ranging from equity joint ventures to acquisition of technology under the provisions of the Convention. There are also other alternatives available in the form of contracts involving associated management services and know-how, training by the suppliers of plant and equipment and joint ventures for the purpose of developing technology only. In the domain of capital funding, options would include the formation of joint ventures with the operating partner's equity varying from a few percentage points to 100 per cent, the arranging of suppliers and/or consumers credit and the arranging of equipment and plant on lease basis. Alternatives exist in the domain of manpower ranging from entering the labour market and hiring the staff to sub-contracting the managerial and technical functions to a competent organization. In the realm of marketing, the Enterprise could either market the finished products itself or employ a marketing organization to do it on a commission basis.

18. The deep sea-bed mining system is also not an undifferentiated and integrated operation and can be divided into the following subsystems:

(a) The mining subsystem consisting of the mining platform and the collection and lifting gear;

(b) The on-sea transport subsystem including the transhipment equipment;

(c) The on-land utilities system including harbour facilities, on-land transportation, power and water supply;

(d) The processing subsystem for extracting metals from the nodules; and

(e) The administrative subsystem including operations, marketing and sales.

19. The Enterprise can itself take up all the activities in a vertically integrated fashion, or can lease some and own some, or can have a joint venture for some subsystem, a lease for others and itself own and operate the rest, or have service contracts, production sharing arrangements, etc. The number of options available to the Enterprise is indeed very large and when taken in conjunction with the choices available in the capital funding, technology and manpower spheres would amount to a few thousand. For the purposes of the project profile it would be necessary to reduce the figure to a more manageable number while retaining those parameters which are necessary for taking a preliminary view at this stage.

20. The important parameters in this regard would be the flows relating to manpower and funds. To enable focussing of attention on these parameters, the following assumptions are being made:

(a) That enough raw material is available to enable 3 million tons of nodules (dry) to be extracted and processed economically for 20 years;

(b) That four metals (nickel, copper, cobalt and manganese) would be extracted from the nodules and that there would be no difficulty in marketing them;

(c) That adequate on-land facilities like harbour facilities, transportation, power and water supply exist and that if in case some do not and new investments have to be made, the Enterprise would only have to lease the newly established facilities at reasonable rates;

(d) That transportation is on leased transport except for one specially designed vessel for dual use owned by the Enterprise whereby fuel oil and other supplies and consumables are carried in one direction while nodules are transported back in the other direction;

(e) That marketing is by the Enterprise with marketing costs amounting to 1 per cent of total sales; and

(f) That requisite skilled manpower and finance are available to the Enterprise.

C. Operational options *

21. The operational arrangements available to the Enterprise could be, inter alia, a mix of: the Enterprise acting as the sole operator, the leasing of the plant and equipment including lease-purchase arrangements, entering into production sharing arrangements, concluding service contracts for operating certain of the subsystems, and the establishment of joint ventures of various kinds. There are many kinds of production sharing arrangements possible depending on whether the Enterprise contributes to the equity or not. Similarily there are a number of operating arrangements possible in the sphere of service contracts for operating the at-sea mining system, the processing plant, the sales system, or all three in differing combinations. Joint venture arrangements could also shade all the way from developing the requisite technology to capitalized joint ventures which both fund and operate the entire system.

22. So as to reduce the alternatives being considered in the paper to a manageable number, it is proposed to consider mixes of: the Enterprise acting as sole operator, the Enterprise entering into a 50:50 equity joint venture, and the Enterprise leasing the plant and the equipment. Production-sharing arrangements on a 50:50 basis would be somewhat similar to the joint venture options while service contracts would be like the leased arrangements.

23. Options which impact on capital flows are the undertaking of the work by the Enterprise itself, entering into a joint venture on a 50:50 basis and leasing the equipment and plant. As per the assumptions in paragraph 13, only the mining and processing subsystems are being made the object of these options since the other subsystems have already been assumed to be performed on the basis of lease or ownership basis by the Enterprise. This would give us the following nine operating arrangements:

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* Deals with commercial operations only. See annex for details.

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(a) Both mining and processing by the Enterprise;

(b) Mining by the Enterprise and processing on lease;

(c) Mining on lease and processing by the Enterprise;

(d) Both mining and processing by lease;

(e) Mining by the Enterprise and processing by joint venture;

(f) Mining by joint venture and processing by the Enterprise;

(g) Mining on lease and processing by joint venture;

(h) Mining by joint venture and processing by lease;

(i) Both mining and processing by joint ventures.

D. Impact on manpower and finance

24. The operational arrangements impact on manpower through the chosen technological option (figure I). In annex II of LOS/PCN/SCN.2/WP.2, four alternative approaches to acquisition, adaptation and modification of technology had been considered. In the first approach, different technologies with the pioneer investors had to be scrutinized, their cost effectiveness evaluated and then the best one acquired. The second approach required the engaging of a systems contractor at the outset while the third approach called for the selection of the pioneer investor or systems contractor after a conceptual design had been done and engineering analysis carried out. In the fourth approach the Enterprise was to act as its own systems contractor and to itself implement the details of the technology acquisition process. In all cases a general estimate of the inflow of staff was provided.

25. It is proposed to use the design and planning manpower figures provided earlier in LOS/PCN/SCN.2/WP.2 for the purposes of the project profile with the joint venture option being covered by alternative 1 and the lease/owned option by means of the figures given in alternatives 3 and 4. 1/ Since the flow of manpower is through time it would, however, be necessary to adapt the flow to the sequencing of activities of the project profile.

26. The above figures, however, cover only the manpower required for the acquisition of a technological and managerial capability for designing, planning and procuring a deep sea-bed mining system. They leave out the manpower requirements for the operating and construction phase of the project. Not many studies have been done in this regard, however, though there is a study by the Department of Planning and Economic Development, State of Hawaii, 2/ which estimates some figures in this regard. The total manpower required for operations for a 3 million ton nodule operation, according to this study, would be of the order of 1,600 while the peak construction force would be of the order of 4,800 (details in table A.1 of the annex).

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27. The assessment of capital requirements is complicated by the fact that there is at present no deep sea-bed mining operation in existence so that all costs have to be based on certain assumptions. Since, however, a number of studies have been made in the late 1970s and early 1980s it is proposed to consider the cost figures emerging from these studies so that first order of magnitude figures can be worked out for the project profile. Studies in the likely costs of 4-metal operations have been made by Shaw, 3/ Flipse and others, 4/ Cameroon and others, 5/ and the Department of Planning and Economic Development, State of Hawaii. 6/ Studies have also been made into the costs of 3-metal operations by Nyhart and others, 7/ Flipse, 8/ Cameroon and others 9/ and the State of Hawaii. 10/ The broad, capital and operative costs emerging from these studies for 4-metal extraction for the different susbsystems, and the capital costs emerging for the mining, the transport and on-land activities for 3-metal extraction, are presented in table 1 below:

Table 1.

	Shaw (1976$)		Cameron (1979$)		Hawaii (1980$)		Flipse (1982$)		Three metal case capital costs (millions US $)			
	Capital costs	Operating costs	Capital costs	Operating costs	Capital costs	Operating costs	Capital costs	Operating costs	Cameron (1979$)	Nyhart (1980$)	Flipse (1982$)	Hawaii (1982$)
Nodules (millions of dry tons)	3.0		1.8		2.2		1.5		1.8	3.0	3.0	2.2
Costs:												
Preinvestment a/	90	-	NA	NA	200	-	195	-	NA	172	195	200
Mining b/	155	40	30-150	20-50	265	55	180	39	30-150	306	345	265
On-sea transport c/	)	20	20-60	10-30	50d/	22	119e/	15	20-60	201	132	50d/
On-land activities f/	) 400	) 138	) 450-650	) 75-150	218g/	40	57	12	) 250-600	60	79	50
Processing h/	)	)	)	)	649	180	512	255i/	)			
Admin., sales, etc. j/	-	12	NA	NA	5	34	2	15				
TOTAL (excluding pre-investment)	555	210	500-860	105-230	1187	331	870	336				
TOTAL (prorated to 3 m.t. dry nodules)	555	210	830-1430	175-380	1618	451	1740	672				

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a/ Preinvestment expenses include costs of exploration and research and development.

b/ Mining expenses include the costs of mining vessels, the nodule collection heads, the lift systems and the discharge systems.

c/ The on-sea transportation expenses include the cost of transport vessels equipped with nodule receiving and storage facilities.

d/ Cost of only one specialized ship the rest being chartered.

e/ Cost of two specialized ships.

f/ On-land transport includes the marine terminal, the transport facility and utilities like power and water supply.

g/ Includes $159 million as the cost of a power plant.

h/ Processing includes the process plant and equipment and the waste disposal facilities.

i/ Includes $119 million as the cost of purchased power.

j/ Administration and sales include senior management, the mine planning survey vessel, offices, insurance, patents and licensing and product selling expenses.

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28. The above figures, even after being corrected for inflation, seem to indicate a rising trend in estimates which would seem to imply that actual costs in the future may be somewhat higher than the estimates of the studies considered in the above table. Otherwise the latest studies do seem to be within the same orders of magnitude especially after corrections are made for power costs (which are on the operating side in the Flipse study and on the capital side in the Hawaii study). In view of the costs of the latest studies being roughly within the same orders of magnitude, for the purposes of the project profile it is proposed to use the Hawaii figures prorated to 3 million tons of dry nodules and appropriately modified to suit the parameters of the project profile, especially since the costs of the Hawaii study are also correlated to manpower requirements in the construction and operating stages.

E. Sequence of activities

29. For working out the flow of finances and manpower it is necessary to establish a sequence of activities in time and to allocate to each activity its requirements of funds and manpower. For establishing the sequence it is assumed that an ad hoc expert core group of four persons dedicated to the work relating to the Enterprise and consisting of a general manager, a technical manager, a financial manager and a scientific research and development manager would be set up in 1987 and also on the further assumption that the Convention would come into force by 1990 11/ so that the Enterprise can be effectively in place by the middle of 1990. The activity flow is depicted in charts I and II of the annex and follows from that delineated in LOS/PCN/SCN.2/WP.2. It needs to be noted that the activity flow is somewhat tight and depends on crucial decisions to be made by the Enterprise (or the Preparatory Commission on behalf of the Enterprise). These decision points are depicted in figure I of LOS/PCN/SCN.2/WP.7. Any adverse decisions at any point could, therefore, lead to delays.

30. From 1987 to 1990 12/ the ad hoc expert core group would appraise the data of the reserved sites, review the available technology and the sources from which it could be acquired, elaborate the organizational and management development needs, estimate the rough costs, and carry out brief conceptual design and feasibility studies. The dedicated group would use outside consultants, if necessary, and during this period draw up the blueprints for establishing an appropriate institutional infrastructure and technology acquisition strategy. From 1989 to 1990 the initial and basic staff likely to be required by the Enterprise immediately pursuant to its establishment will be recruited and sent for training. In 1990 the Enterprise decides on its technology strategy, draws up its plan of work, negotiates for joint ventures and lease arrangements, takes its decision on the mining site to be developed and authorizes studies on possible sites for the processing plant.

31. In 1991 a final decision on the location of the processing plant is taken and, if applicable, leasing arrangements are finalized. From 1991 to the middle of 1992 preliminary design of the deep sea-bed mining system is done and the subsystem model tests conducted. If these are satisfactory, a decision is taken to configure the at-sea mining system and to test it for endurance over long periods of time. During this phase nodules (100,000 to 200,000 tons) are stockpiled, the mining equipment debugged and, if all goes according to plan, a decision taken to set up a demonstration processing plant. The demonstration plant is set up at the proposed location of the processing system and production runs are made to test its capabilities for

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long, continuous metal-winning operations. The final products are also used for conducting marketing surveys and, if possible, for finalizing long-term supply contracts with the potential consumers. The results of the tests are evaluated and, everything being satisfactory, decision to go ahead with the commercial project is taken by the middle of 1995.

32. From the middle of 1995 work on the design specifications is started and contract plans and specifications for the mining and processing equipment and systems finalized. The period up to 1997 constitutes what may be called as the preinvestment phase of the project - and is depicted graphically in Chart I of the annex. In the investment phase of the project commencing from 1997 (chart II of the annex) orders for the plant and equipment are placed, the various subsystems acquired and assembled and final tests on the mining and processing subsystems performed so that everything is completed by the year 2001. The first half of the year 2001 is utilised for starting up the deep sea-bed mining system so that snags, if any, are debugged enabling the system to function at full capacity in the year 2002. It is being assumed that during 2001 the production is 50 per cent of the annual production and that two months production gets sold during the year so that the working capital component represents four months operating expenses.

F. Manpower and financial flow for different operating conditions

33. Having assumed the requirements of manpower and finance for the various segments of the deep sea-bed mining system, and also having established the sequence of activities, the manpower and financial flows of the different options are worked out. This is elaborated in the annex and the tables attached thereto. The main results may, however, be summarised here.

34. It is possible to rank the different options according to requirements of manpower, total capital requirements, gross return till 1 January 2022, and payback period/return per unit of capital employed. According to the figures emerging, the lease options come out the best in terms of payback period, gross return per unit of capital, and capital requirements while the wholly owned and lease options come out best in terms of total gross returns till 1 January 2022. The joint venture options come out best in terms of manpower requirements with the owned/lease option being the worst. The position according to financial parameters is as per Table 2 below.

Table 2: Financial Ranking

Operating Mode		Return per unit of capital		Capital requirements		Payback period		Gross capital return	
Mining by	Processing by	Total	Rank	Total	Rank	Years*	Rank	Total	Rank
Lease	Lease	20.0	I	421	I	5	I	8435	IV
Joint Venture	Lease	12.6	II	573	II	6	II	7105	VI
Enterprise	Lease	10.7	III	829	IV	6	III	8860	III
Lease	Joint Venture	8.2	IV	787	III	7	IV	6467	VIII
Lease	Enterprise	7.0	V	1336	VII	7	V	9385	II
Enterprise	Joint Venture	5.7	VI	1195	VI	7	VI	6871	VII
Enterprise	Enterprise	5.6	VII	1744	IX	7	VII	9810	I
Joint Venture	Joint Venture	5.6	VIII	916	V	7	VIII	5159	IX
Joint Venture	Enterprise	5.4	IX	1499	VIII	8	IX	8053	V

* Years from start of investment

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35. The position according to design and managerial manpower requirements is as in table 3 below:

Table 3: Ranking in terms of manpower requirements (1989-1995)

Rank	Operating Mode		Design and Managerial Manpower Required						
	Mining by	Processing by	1989	1990	1991	1992	1993	1994	1995
I	Joint Venture	Joint Venture	28	28	28	28	28	100	100
II	Joint Venture	Enterprise	73	96	96	103	103	140	140
II	Joint Venture	Lease							
II	Enterprise	Joint Venture							
II	Lease	Joint Venture							
III	Lease	Lease	99	136	136	148	148	160	160
III	Lease	Enterprise							
III	Enterprise	Lease							
III	Enterprise	Enterprise							

36. When processing activities are undertaken by the Enterprise, then production sharing arrangements on a 50:50 basis regarding at-sea mining would financially rank almost last while service contracts for at-sea activities would be somewhere in the middle. However a service contract for the entire operation, or a 50:50 production-sharing arrangement for the mining, and a service contract for the processing plant, would be near the top from the financial point of view.

37. Another point of interest is that economic feasibility being assured, the bulk of the investment (80 to 90 per cent) occurs in the period 1997 to 2001 and is recovered in the years 2002 to 2004. In the most capital-intensive case (where the Enterprise operates the entire system) for example, the investment of almost $1.7 billion could, under favourable market conditions, be recovered within three to four years of the start of commercial operations. 13/ Besides, such a favourable cash flow should make it possible for the Enterprise to obtain 75 to 80 per cent of the investment from financial institutions thereby reducing equity contributions of States to approximately $400 million (1980 prices).

38. In the least capital-intensive case (where plant and machinery for both the mining and processing systems are leased), the total investment can, under favourable market conditions, be recovered in one or two years 14/ after the start of commercial operations. Equity contributions in this case (after commercial borrowing) could be of the order of $150-200 million (1980 prices).

Notes

1/ It needs to be noted that the figures could vary from -40 per cent to +100 per cent as per LOS/PCN/SCN.2/WP.2.

2/ State of Hawaii, Department of Planning and Economic Development, The Feasibility and Potential Impact of Manganese Nodule Mining, November 1981.

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3/ K.D. Shaw, Ocean Mining Costs and Revenues, a report presented to a seminar held under the auspices of the European Economic Community in 1977, mimeo.

4/ J.E. Flipse and others, The Economic Viability of a Four-Metal Pioneer Deep Ocean Mining Venture (Texas A & M University, Sea Grant College Program, October 1983).

5/ Hugh Cameron and others, Manganese Nodule Mining: Issues and Perspectives (Department of Liberal Studies in Science, Manchester University, U.K., February 1980).

6/ State of Hawaii, op. cit.

7/ J.D. Nyhart and others, A Pioneer Deep Ocean Mining Venture (MIT Sea Grant Program, June 1983).

8/ J.E. Flipse, op. cit., in which the figures from an earlier report by Flipse are updated to 1982 dollars.

9/ Hugh Cameron, op. cit.

10/ State of Hawaii, op. cit.

11/ Since the coming into force of the Convention is dependent on the rate of ratification of or accession by States, the date 1990 could move in either direction with consequent impacts on other dates.

12/ It needs to be noted that these and all subsequent dates are, as in LOS/PCN/SCN.2/WP.2, dependent on adequate flow of finance and manpower and on everything going according to the anticipated scenario.

13/ The figure for the payback period from the beginning of the investment period would be seven years (and not three). It needs to be noted that this satisfactory position is crucially dependent on all four metals being sold at prices prevalent around 1980 during the period 2001-2021.

14/ Five years if counted from the beginning of the investment period.

Annex

MANPOWER AND FINANCIAL FLOWS OF THE ENTERPRISE'S MINING PROJECT

1. For reasons given in the main paper it has been decided to use the manpower and cost figures (prorated to a mining operation of 3 million tons (m.t.) per year of dry nodules) developed in the study of the Department of Planning and Economic Development, State of Hawaii. The Hawaii study is based on a 2.2 million tons per year (dry nodules) operation with 4-metals, namely, copper, cobalt, nickel and ferromanganese, being recovered from the nodules. All the costs and revenues are in 1980 $US. The position as per the Hawaii report and what is assumed for the Enterprise is as per table A.1 below:

Table A.1

	Capital Costs		Operating Expenses		Assumed for the Enterprise	
	for 2.2 m.t.	Prorated to 3 m.t.	for 2.2 m.t.	Prorated to 3 m.t.	Capital costs	Annual Operating
Preparatory expenses Exploration, R&D	200	200	-	-	150	-
Mining	265	360	55	75	360	75
On-sea transportation	50	50	22	30	50	30
On-land activities	218	300	40	55	300	55
Processing	649	885	180	245	885	245
General, sales, etc	10	10	34	45	10	45
Revenues: a/						
Nickel			230	313		313
Copper			57	78		78
Cobalt			185	252		252
Ferromanganese			295	402		402
Total Revenues			767	1045		1045

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a/ Except for the price of cobalt, other prices used in the Hawaii study are roughly comparable to the forecasts made by the U.S. Bureau of Mines for the year 2000 in 1975 constant dollars. The price of cobalt is on the high side. See Office of Ocean Resources and Scientific Policy Co-ordination, United States Department of Commerce, Cobalt, Copper, Nickel and Manganese: Future Supply and Demand and Implications for Deep Seabed Mining, circa 1979.

2. In the above table preparatory expenses for the Enterprise have been assumed $ 50 million lower than in the Hawaii study because, firstly, prospected sites are being made available to the Enterprise and secondly, the costs to be incurred by the Enterprise for developing/buying the mining and processing technology are expected to be somewhat lower than what has been assumed in the Hawaii study as applicable to the private consortia. The capital costs for on-sea transport and administration have been taken as for the 2.2 m.t. operation because the Enterprise will own only one specialized vessel, while chartering the rest, while its expenses on its headquarters building etc. will be the same for a 3 m.t. as for a 2.2 m.t. operation.

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3. The capital costs have to be broken down into yearly flows on the basis of activities delineated in charts I and II and the operating assumptions made earlier (paragraph 13 of main paper) whereby the on-land infrastructural activities are to be leased and not owned. For a mining operation which is fully funded by the Enterprise the capital flows would be for the mining and processing plant and equipment, the preparatory expenses and administration. The rest of the expenditures would be in the form of operating/lease expenses which would come into operation in the year 2001.

4. Preparatory expenses are to be incurred on exploration and research and development. Exploration is either to establish the amount of ore and grade and to determine the parameters required to design the mining equipment, or to establish the mining plan including the path to be followed by the mining vessel in the exploitation stage. The site to be explored and exploited by the Enterprise, and its parameters, being unknown at this stage, it is not possible to know whether any exploration to determine the grade or abundance of the nodules or data parameters relating to design of the equipment would be necessary. For the purposes of the project profile, however, a cost of $9 million during the period 1988-1990 is being assumed as requiring to be incurred by pioneer investors on behalf of the Enterprise on a reimbursable basis. a/ Some activity in 1997 and 1998 (amounting to $6 million) to gather any further data that might be required for designing the mining system as well as a yearly expense of $6 million from 1999 onwards for establishing the mining plan are also being assumed. The expenses incurred from 1997 to 2000 on manpower and exploration would be a part of the capital costs, while those incurred from 2001 onwards would be subsumed in operating expenses. The rest of the preparatory expenses of $123 million would be incurred between the years 1992-1997 when the at-sea tests would be carried out and the demonstration processing plant tested. The position of preparatory expenses would be as in table A. 2 below:

Table A. 2
(Millions of 1980 US dollars)

Activity	1988	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	2000	Total
Exploration	3	3	3	-	-	-	-	-	-	3	3	6	6	27
R & D	-	-	-	-	12	27	28	28	28	-	-	-	-	123
Mining	-	-	-	-	6	14	14	14	14	-	-	-	-	62
Processing	-	-	-	-	6	13	14	14	14	-	-	-	-	61

5. The mining, processing and transport equipment has to be bought between the years 1997-2000. For the transport vessel, the two-year period of 1999-2000 is being assumed for expenditure while for the mining and processing plant and equipment the four-year period (1997-2000) is being assumed with the bulk of expenditures being in the last two years. The position of the capital flows as assumed are as in table A. 3 below:

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Table A. 3
(Millions of 1980 US dollars)

Activity	1997	1998	1999	2000	TOTAL
Administration	10	-	-	-	10
Transportation	-	-	20	30	50
Mining	44	70	138	108	360
Processing	25	115	360	385	885

6. The operating and lease expenses start being incurred from the year 2001. For the first year, since production is considered to be likely to be 50 per cent of yearly rated production, operating expenses of half the yearly value are being assumed. For the leased equipment also half years expenses are being assumed, or in other words, the start-up period as well as testing of the mining and processing system, if on lease, has been assumed to be on the lessor's account. It is necessary to link the lease costs with the capital value. Nyhart b/ has assumed the constant non-inflationary value of interest, including the risk premium, at 5 per cent. Assuming capital amortization of 15-20 years gives a lease rental of approximately 10-8 per cent. For the purposes of the project profile we will be taking 10 per cent of the capital cost as the lease rental. This gives the following yearly operational and lease costs effective from the year 2002:

Table A. 4
(Millions of 1980 US dollars)

Activity	Operational costs	Lease costs
Mining	75	42*
On-sea activities	30	-
On-land activities	55	30
Processing	245	94*
Administrative, sales, etc.	45	-

* When processing and/or mining are on lease

7. The manpower requirements of the Enterprise in the pre-production stage differ from those in the production or commercial operation stage. In the preparatory stage the accent is on planning, design and procurement of equipment while in the production stage the stress is on operational manpower. During construction there is a large increase in the number of people required to set up the plant but for the purposes of the project profile it is being assumed that this manpower would be the responsibility of the contractor and so would not be a charge on the Enterprise. The peak requirements of construction manpower for a 2.2 m.t. processing plant have been calculated by the Hawaii study to be 3,500 (or about 4,800 when prorated to a 3 m.t. operation). The operating requirements of manpower have been estimated as follows:

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Table A.5: Operational personnel requirements for the Enterprise

Personnel	For 2.2 m.t.	For 3 m.t. (prorated)
A. Land-based Operations		
1. Senior management and staff	75	102
2. Supervisory and technical personnel	135	185
3. Plant/equipment operators/helpers	315	430
4. Maintenance personnel	150	205
5. Unskilled labour and trainees	75	103
B. Mining Operations (including relief crews)	328	328
C. Transportation	160	240
TOTAL	1238	1593

8. For the purpose of the project profile, we will assume that the design and planning staff is continued during the operating stage while an additional 74-75 management staff and 1,450 operating staff are added on during the phase of commercial operations. For the preparatory stage it has been decided to use the earlier figures given in LOS/PCN/SCN.2/WP.2. For the wholly owned or partly owned and partly leased options the figures would be the mean of alternatives 3 and 4 of WP.2 while in the case of the joint venture for the whole operation, alternative 1 figures would be used. For the other options, a mix of the two would be used. The figures to be used for the owned option, would be as under:

Table A.6: Pre-production manpower requirements of the Enterprise
(owned or leased by the Enterprise)

Personnel	1987-1988	1989	1990-1991	1992-1993	1994-1995	1996-1997	1998-1999	2000
Managerial	4	8	10	12	14	15	15	24
Design	-	72	100	110	120	110	110	150
Scientists	-	19	26	26	26	26	26	26
Support	4	15	19	24	27	28	28	28
Operating	-	-	-	-	21	-	21	131
TOTAL	8	114	155	172	208	179	200	359

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9. The figures for the joint venture option are as under:

Table A.7: Pre-production manpower requirements of the Enterprise
(joint venture for both processing and mining)

Personnel	1987-1988	1989	1990-1991	1992-1993	1994-1995	1996-1997	1998-1999	2000
Managerial	4	4	4	4	11	14	14	20
Design	-	20	20	20	80	80	80	120
Scientists	-	4	4	4	9	9	9	9
Support	4	8	8	8	14	23	24	30
Operating	-	-	-	-	21	-	21	131
TOTAL	8	36	36	36	135	126	148	310

Alternative 1: Both mining and processing by the Enterprise

10. In the case of the wholly owned operation, the Enterprise's requirements of funds and manpower would be as in table 1-A with the total requirement of capital (including working capital) amounting to $1,744 million. The flow of funds and manpower in the preinvestment and the postinvestment phases would be as in tables 1-B and 1-C with the simplified cash flow as in table 1-D. The payback period in terms of gross earnings would be 7 years from the beginning of the investment period, gross earnings in 20 years would be $9,810 million while gross return per unit of capital would be 5.6.

Alternative 2: Mining by the Enterprise and processing on lease

11. The Enterprise's requirements of funds and manpower is as per table 2-A, the flow of funds and manpower in the preinvestment and postinvestment phases is as in tables 2-B and 2-C, and the simplified operating cash flow is in table 2-D. As can be seen, capital expenses on processing are down by $885 million and costs in the preparatory stage are down by $61 million (the costs of testing and research and development on the processing equipment) while lease costs on processing go up by $94 million. In this option the total requirement of capital is $829 million, the payback period is 6 years, gross lifetime project earnings are $8,860 million and gross return per unit of capital is 10.7.

Alternative 3: Mining on lease and processing by the Enterprise

12. In this case, capital costs on mining and preparatory expenses are lower by $360 million and $62 million, respectively, while lease costs of mining go up by $42 million. The position may be seen in tables 3-A, 3-B, 3-C and 3-D. The total requirement of capital works out to $1,336 million, the payback period is 7 years, gross project earnings are $9,385 million and gross return per unit of capital is 7.0.

Alternative 4: Both mining and processing on lease

13. The capital requirements for mining, processing and preparatory expenses are lower by $160, $884 and $63 million respectively while the lease costs for mining and processing are up by $42 and $94 million respectively. The total capital and manpower requirements, their flows and the simplified operating

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cash flow are at tables 4-A, 4-B, 4-C and 4-D. The total requirement of capital is $421 million, the payback period is 5 years, gross project earnings are $8,435 million and gross return per unit of capital is 20.0.

Alternative 5: Mining by Enterprise and processing by joint venture

14. In this alternative it is assumed that half of the costs on on-land activities and the processing plant are met by the joint venture partner as well as that half of the research and development and testing costs on processing and yearly administrative expenses are attributable to processing. Going on the basis of capital investments, $30 million of operating administrative costs have been considered attributable to processing and $12 million to mining. Similarly on the basis of capital ratios, $700 million of the revenues of $1,045 million are being attributed to processing, $286 million to mining and the rest to transport. c/ On the basis of the above assumptions, capital costs to be incurred by the Enterprise in processing are lower by $443 million, on-land operating/lease costs are lower by $42 million, processing operating costs are down by $123 million, administrative operating expenses are down by $15 million and preparatory expenses are lower by $30 million. Concomitantly the revenues of the Enterprise are lower by $350 million per year.

15. On the basis of the above, total capital requirements are $1,195 million, payback period is 7 years, gross project earnings are $6,871 million and gross return on a unit of capital is 5.7 as can be seen from tables 5-A, 5-B, 5-C and 5-D.

Alternative 6: Mining by joint venture and processing by the Enterprise

16. In this alternative mining costs are down by half, operating administrative costs are lower by $6 million, research and development and testing costs are $93 million and exploration would cost $13 million. Revenues available to the Enterprise would be $902 million or $143 million lower because of the joint venture in mining.

17. On the above basis, total capital requirements work out to $1,499 million, payback period is 8 years, gross project earnings are $8,053 million and gross return per unit of capital is 5.4.

Alternative 7: Mining on lease and processing by joint venture

18. On the basis of what has been stated earlier regarding leases and joint ventures the figures on manpower and capital, their flows and operating cash flow are as in tables 7-A, 7-B, 7-C, 7-D with total capital requirements standing at $787 million, payback period being 7 years, gross project earnings equalling $6,467 million and gross return on capital being 8.2.

Alternative 8: Mining by joint venture and processing on lease

19. Tables 8-A, 8-B, 8-C and 8-D give all the data. Mining costs are down by half, administrative operating costs by $6 million, exploration by $14 million, processing research and development, etc. by $61 million and mining testing etc. by $32 million. Revenues are down by $143 million as in alternative 6 while capital costs in processing are replaced by lease costs as in alternative 2. In the result, total capital requirements are $573 million, payback period is 6 years, gross project earnings are $7,105 million and gross return per unit of capital is 12.4.

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Alterna'ive 9: Both mining and processing by joint venture

20. In this case costs on mining, processing and on-land activities are reduced by half while preparatory expenses are $75 million. The position emerging from ables 9-A, 9-B, 9-C and 9-D is that capital requirements amount to $916 million. Since revenues attributable to mining and processing add up to $986 million, revenues to the Enterprise fall by $493 and we get gross project earnings of $5,159, a payback period of 7 years and a gross return on a unit of capital of 5.6.

Notes

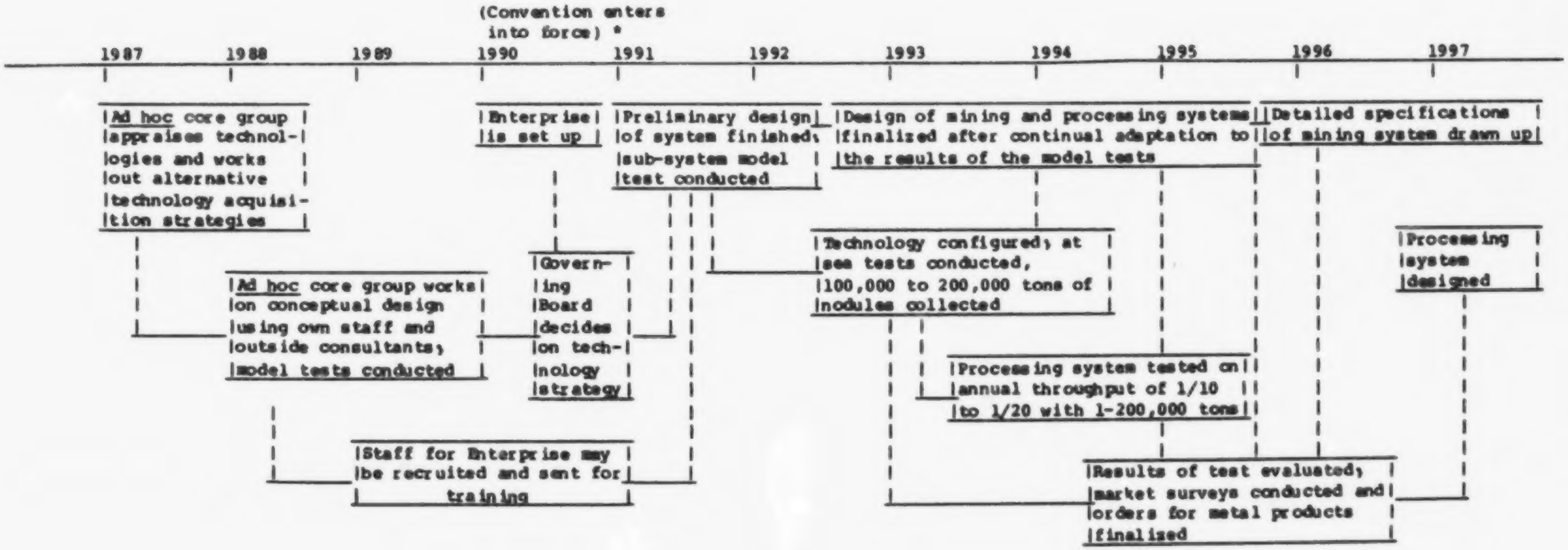
a/ This figure is based on an average of estimates of future exploration expenditures included in the application by two consortia, KCON (Kennecott Consortium) and OMA (Ocean Mining Associates), submitted in 1982 to the National Oceanic and Atmospheric Administration, U.S. Department of Commerce. The estimated expenditures for the former consortium are $US 6.2 million in 1981 dollars and for the latter are $US13 million in 1983 dollars. See KCON, Application for Exploration License under P.L. 96/283, (filed with NOAA, 16 February 1982) and Ocean Mining Associates, Application by OMA for an Exploration License (filed with NOAA, 18 February 1982). The equal annual distribution of US$3 million within the 1988-1990 period has been made for the sake of convenience.

b/ J.D. Nyhart and others, A Pioneer Deep Ocean Mining Venture (MIT Sea Grant Program, June 1983), p. 66.

c/ Since only one ship is purchased (at $50 million) and the rest are chartered, for the purpose of revenues $75 million capital is assumed for the transport sector.

Chart I

Sequencing of activities of the Enterprise in the preparatory and pre-investment stage *


(Convention enters into force) *
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
Ad hoc core group appraises technologies and works out alternative technology acquisition strategies
Ad hoc core group works on conceptual design using own staff and outside consultants, model tests conducted
Staff for Enterprise may be recruited and sent for training
Enterprise is set up
Governing Board decides on technology strategy
Preliminary design of system finished, sub-system model test conducted
Design of mining and processing systems finalized after continual adaptation to the results of the model tests
Technology configured, at sea tests conducted, 100,000 to 200,000 tons of nodules collected
Processing system tested on annual throughput of 1/10 to 1/20 with 1-200,000 tons
Results of test evaluated, market surveys conducted and orders for metal products finalized
Detailed specifications of mining system drawn up
Processing system designed

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* The year the Convention would come into force could move in either direction along with all later dates depending upon the rate of ratifications or accessions.

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Chart II

Sequencing of activities of the Enterprise after the investment has started and until commercial production begins

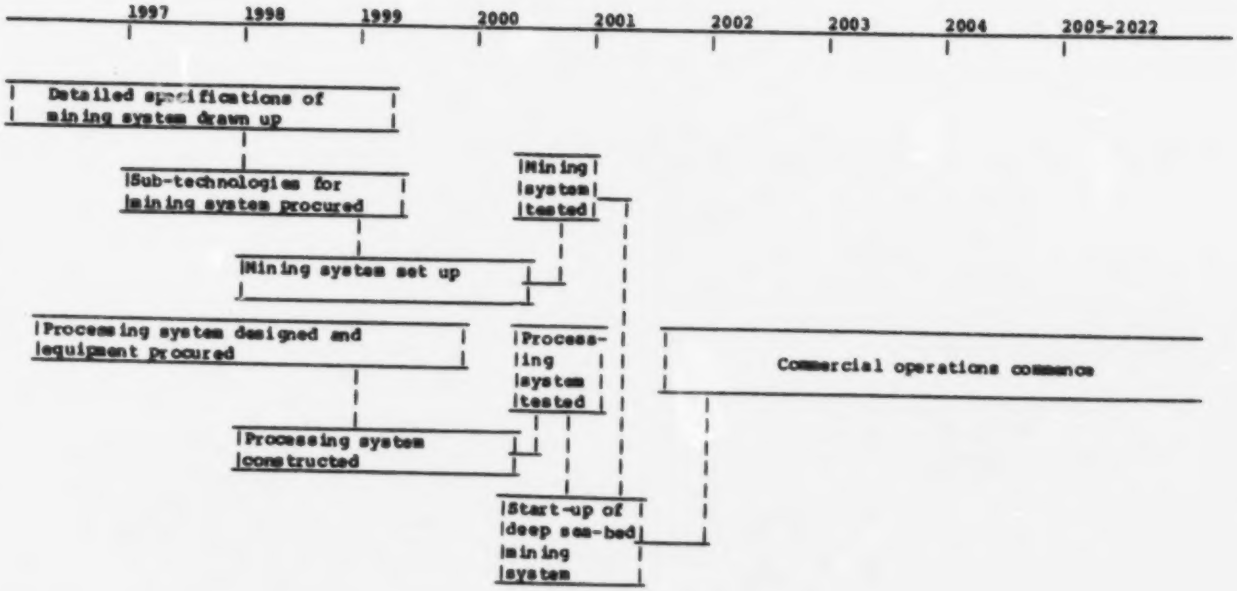

Table 1A: Requirements of funds and manpower where both mining and processing are by the Enterprise

Manpower

Type of manpower	1987-1988	1989	1990-1991	1992-1993	1994-1995	1996-1997	1998-1999	2000	2001	2002 2021
Managerial	4	8	10	12	14	15	15	24	29	29
Engineering										
Mining		36	50	55	60	55	55	75	85	85
Processing		36	50	55	60	55	55	75	85	85
Scientific		19	26	26	26	26	26	26	26	26
Subtotal: Managerial and technical	4	99	136	148	160	151	151	200	225	225
Personnel										
Support	4	15	19	24	27	28	28	28	40	46
Operating	-	-	-	-	21	-	21	131	960	1554
Subtotal: Support and operating	4	15	19	24	48	28	49	159	1000	1600
TOTAL	8	114	155	172	208	179	200	359	1225	1825

Total cost of manpower (1987-2000) = $US 129 million (1980)

Funds (millions of 1980 US dollars)

	ACTIVITY						
	Mining	On-sea transportation	On-land activities	Processing	Admin.+ Sales	Preparatory (+manpower)	TOTAL
Capital	360	50	-	885	10	279	1584
Operating	75	30	55	245	45	-	450
Lease	-	-	30	-	-	-	30
Working capital 1/3 (Operating plus lease)	25	10	28	82	15	-	160
TOTAL CAPITAL	385	60	28	967	25	279	1744

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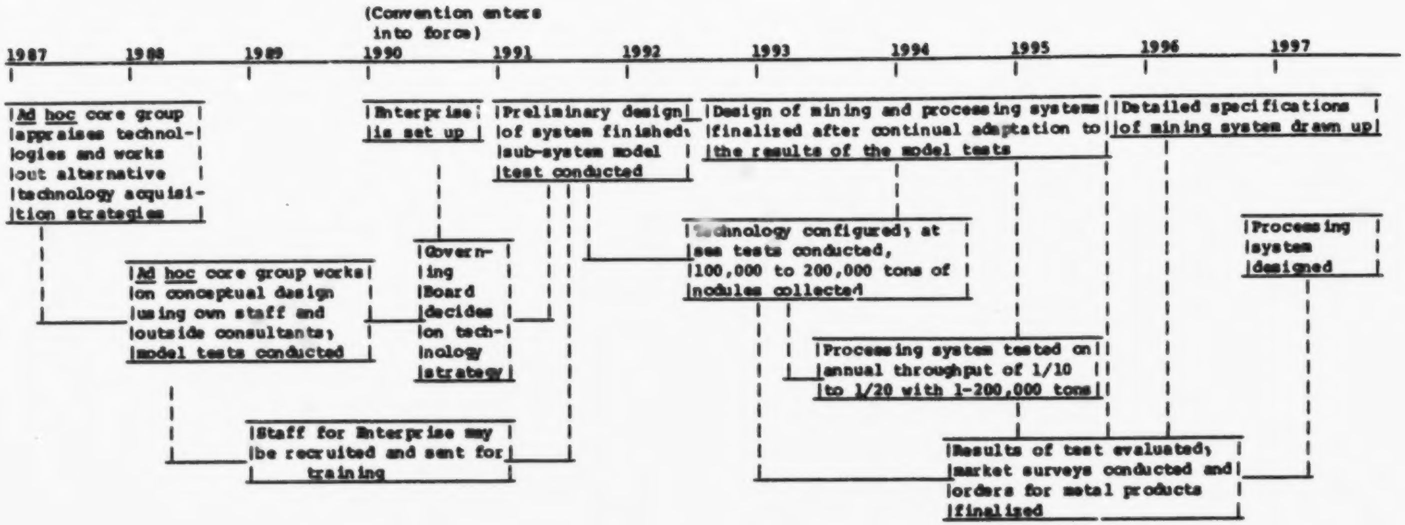
Table 18: Pre-investment flows when both mining and processing are by the Enterprise


(Convention enters into force)
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
Ad hoc core group appraises technologies and works out alternative technology acquisition strategies
Enterprise is set up
Preliminary design of system finished; sub-system model test conducted
Design of mining and processing systems finalized after continual adaptation to the results of the model tests
Detailed specifications of mining system drawn up
Ad hoc core group works on conceptual design using own staff and outside consultants; model tests conducted
Governing Board decides on technology strategy
Technology configured; at sea tests conducted, 100,000 to 200,000 tons of nodules collected
Processing system designed
Processing system tested on annual throughput of 1/10 to 1/20 with 1-200,000 tons
Staff for Enterprise may be recruited and sent for training
Results of test evaluated; market surveys conducted and orders for metal products finalized

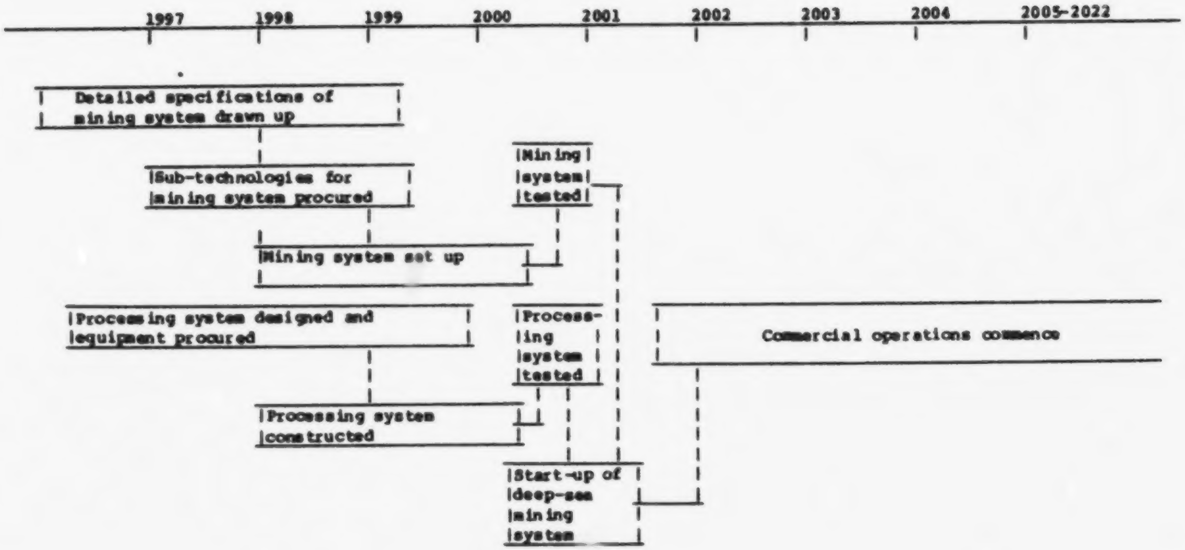
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Manpower flow										
Managerial and design	4	4	99	136	136	148	148	160	160	151
Operative & support	4	4	15	19	19	24	24	48	48	28
Funds flow (million 1980 USD)										
R&D, testing						-12	-27	-28	-28	-28
Exploration		-3*	-3*	-3*						
Costs of manpower	-1**	-1**	-7	-9	-9	-10	-10	-12	-12	-10
Total annual flow	-1	-4	-10	-12	-9	-22	-37	-40	-40	-38

Accumulated total cash flow: -213

* Exploration costs will be incurred by pioneer investors on a re-imbursable basis.

** Includes salaries and wages of experts, costs of using outside consultants and other overhead expenses.

Table 1C: Post-investment flows when both mining and processing are by the Enterprise


1997
1998
1999
2000
2001
2002
2003
2004
2005-2022
Detailed specifications of mining system drawn up
Sub-technologies for mining system procured
Mining system tested
Mining system set up
Processing system designed and equipment procured
Processing system tested
Commercial operations commence
Processing system constructed
Start-up of deep-sea mining system

	1997	1998	1999	2000	2001	2002	2003	2004	2005-2022
Manpower flows									
Managerial and design	151	151	151	200	225	225	225	225	225
Operative and support	28	49	49	159	1000	1600	1600	1600	1600
Funds flow (millions 1980 US$)									
Capital (-)	-92	-199	-535	-545					
Operating (-)					-240	-480	-480	-480	-480 every year
Revenues (+)					174	1045	1045	1045	1045 every year
Yearly total	-92	-199	-535	-545	-66	565	565	565	565 every year
Accumulated flow from pre-investment stage	-213								
Cumulative cash flow	-305	-504	-1039	-1584	-1650	-1085	-520	45	9810 by year 2021

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Table 1D: Simplified operating cash flow when both mining and processing are by the Enterprise

(Millions of 1980 US dollars)

	1987-1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006-2020	2021
Capital costs	-213	-92	-199	-535	-545	-	-	-	-	-	-	-
Operating costs	-	-	-	-	-	-240	-480	-480	-480	-480	-480	-320
Revenues	-	-	-	-	-	174	1045	1045	1045	1045	1045	1045
Operating income	-213	-92	-199	-535	-545	-66	565	565	565	565	565	725
Cumulative operating income	-213	-305	-504	-1039	-1584	-1650	-1085	-520	45	610	9085	9810

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Table 2A: Requirements of funds and manpower where mining is by the Enterprise and processing is by lease

Manpower

Type of manpower	1987-1988	1989	1990-1991	1992-1993	1994-1995	1996-1997	1998-1999	2000	2001	2002-2021
Managerial	4	8	10	12	14	15	15	24	29	29
Engineering										
Mining		36	50	55	60	55	55	75	85	85
Processing		36	50	55	60	55	55	75	85	85
Scientific		19	26	26	26	26	26	26	26	26
Subtotal: Managerial and technical	4	99	136	148	160	151	151	200	225	225
Personnel										
Support	4	15	19	24	27	28	28	28	40	46
Operating	-	-	-	-	21	-	21	131	960	1554
Subtotal: Support and operating	4	15	19	24	48	28	49	159	1000	1600
TOTAL	8	114	155	172	208	179	200	359	1225	1825

Total cost of manpower (1987-2000) = $US 129 million (1980)

Funds (millions of 1980 US dollars)

	ACTIVITY						
	Mining	On-sea trans-portation	On-land activities	Process-ing	Admin.+ Sales	Prepara-tory (+manpower)	TOTAL
Capital	360	50	-	-	10	218	638
Operating	75	30	55	245	45	-	450
Lease	-	-	30	94	-	-	124
Working capital 1/3 (Operating plus lease)	25	10	28	113	15	-	191
TOTAL CAPITAL	385	60	28	113	25	218	829

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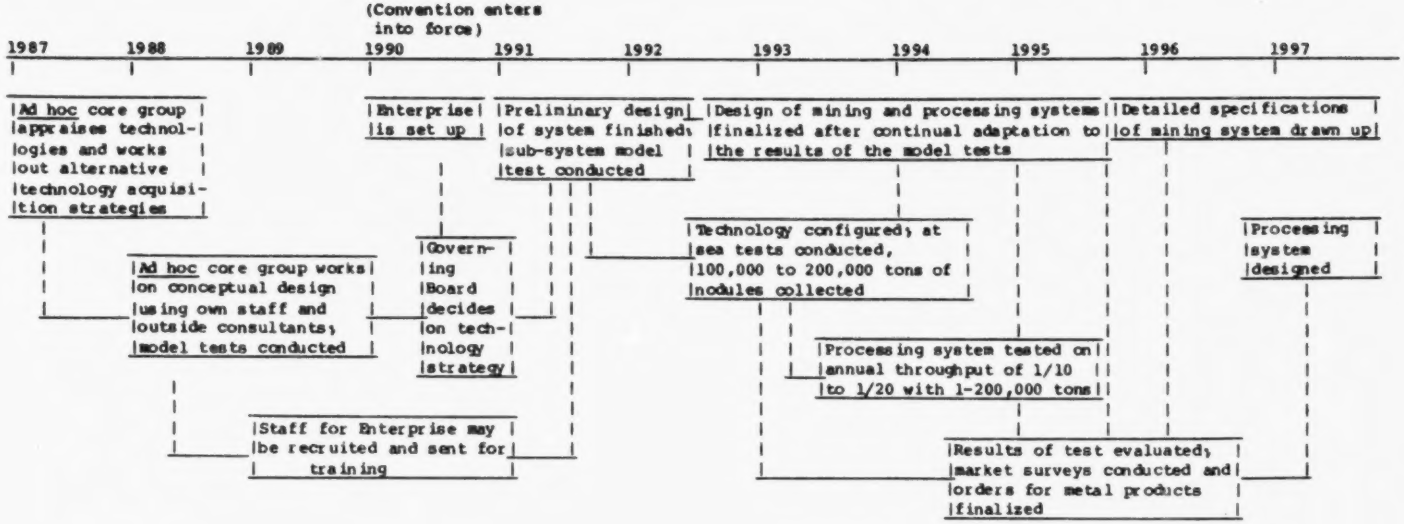
Table 2B: Pre-investment flows when mining is by the Enterprise and processing is by lease



Ad hoc core group appraises technologies and works out alternative technology acquisition strategies

Ad hoc core group works on conceptual design using own staff and outside consultants; model tests conducted

Staff for Enterprise may be recruited and sent for training

Enterprise is set up

Governing Board decides on technology strategy

Preliminary design of system finished; sub-system model test conducted

Design of mining and processing systems finalized after continual adaptation to the results of the model tests

Technology configured; at sea tests conducted, 100,000 to 200,000 tons of nodules collected

Processing system tested on annual throughput of 1/10 to 1/20 with 1-200,000 tons

Results of test evaluated; market surveys conducted and orders for metal products finalized

Detailed specifications of mining system drawn up

Processing system designed

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Manpower flow										
Managerial and design	4	4	99	136	136	148	148	160	160	151
Operative & support	4	4	15	19	19	24	24	48	48	28
Funds flow (millions 1980 US$)										
R&D, testing						-6	-14	-14	-14	-14
Exploration		-3*	-3*	-3*						
Costs of manpower	-1**	-1**	-7	-9	-9	-10	-10	-12	-12	-10
Total annual flow	-1	-4	-10	-12	-9	-16	-24	-26	-26	-24

Accumulated total cash flow: -152

* Exploration costs will be incurred by pioneer investors on a re-imbursable basis.
** Includes salaries and wages of experts, costs of using outside consultants and other overhead expenses.

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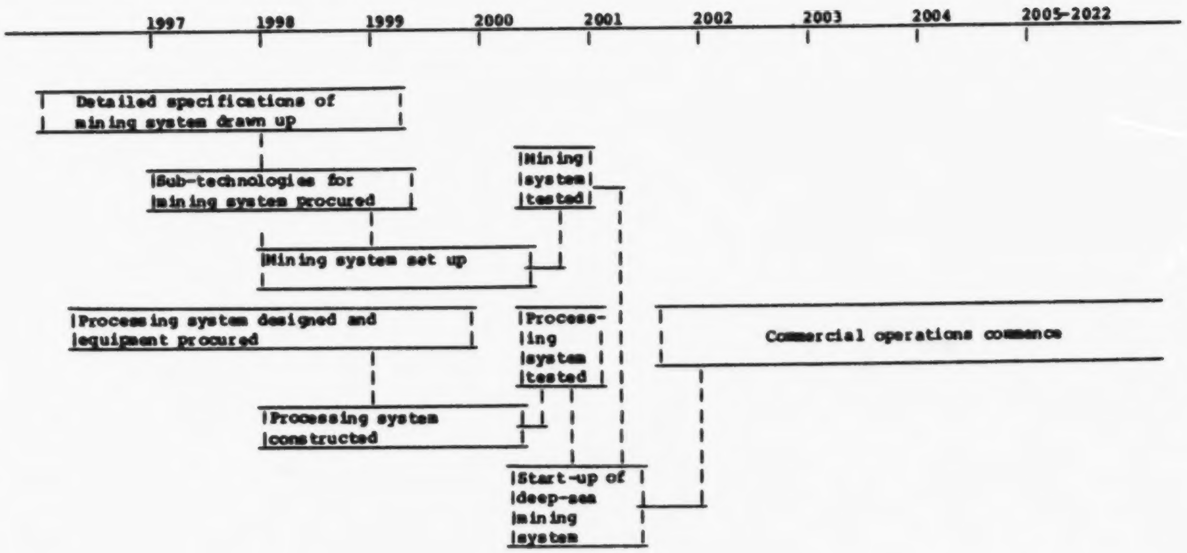
Table 2C: Post-investment flows when mining is by the Enterprise and processing is by lease


1997
1998
1999
2000
2001
2002
2003
2004
2005-2022
Detailed specifications of mining system drawn up
Sub-technologies for mining system procured
Mining system set up
Mining system tested
Processing system designed and equipment procured
Processing system tested
Processing system constructed
Start-up of deep-sea mining system
Commercial operations commence

	1997	1998	1999	2000	2001	2002	2003	2004	2005-2022
Manpower flows									
Managerial and design	151	151	151	200	225	225	225	225	225
Operative and support	28	49	49	159	1000	1600	1600	1600	1600
Funds flow (millions 1980 US$)									
Capital (-)	-67	-84	-175	-160					
Operating (-)					-287	-574	-574	-574	-574 every year
Revenues (+)					174	1045	1045	1045	1045 every year
Yearly total	-67	-84	-175	-160	-113	471	471	471	471 every year
Accumulated flow from pre-investment stage	-152								
Cumulative cash flow	-219	-303	-478	-638	-751	-280	191	662	8860 by year 2021

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Table 2D: Simplified operating cash flow when mining is by the Enterprise and processing is by lease

(Millions of 1980 US dollars)

	1987–1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006–2020	2021
Capital costs	-152	-67	-84	-175	-160	-	-	-	-	-	-	-
Operating costs	-	-	-	-	-	-287	-574	-574	-574	-574	-574	-383
Revenues	-	-	-	-	-	174	1045	1045	1045	1045	1045	1045
Operating Income	-152	-67	-84	-175	-160	-113	471	471	471	471	471	662
Cumulative Operating income	-152	-219	-303	-478	-638	-751	-280	191	662	1133	8198	8860

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Table 3A: Requirements of funds and manpower where mining is by lease and processing is by the Enterprise

Manpower

Type of manpower	1987-1988	1989	1990-1991	1992-1993	1994-1995	1996-1997	1998-1999	2000	2001	2002 2021
Managerial	4	8	10	12	14	15	15	24	29	29
Engineering										
Mining		36	50	55	60	55	55	75	85	85
Processing		36	50	55	60	55	55	75	85	85
Scientific		19	26	26	26	26	26	26	26	26
Subtotal: Managerial and technical	4	99	136	148	160	151	151	200	225	225
Personnel										
Support	4	15	19	24	27	28	28	28	40	46
Operating	-	-	-	-	21	-	21	131	960	1554
Subtotal: Support and operating	4	15	19	24	48	28	49	159	1000	1600
TOTAL	8	114	155	172	208	179	200	359	1225	1825

Total cost of manpower (1987-2000) = $US 129 million (1980)

Funds (millions of 1980 US dollars)

	ACTIVITY						
	Mining	On-sea transportation	On-land activities	Processing	Admin.+ Sales	Preparatory (+manpower)	TOTAL
Capital	-	50	-	885	10	217	1162
Operating	75	30	55	245	45	-	450
Lease	42	-	30	-	-	-	72
Working capital 1/3 (Operating plus lease)	39	10	28	82	15	-	174
TOTAL CAPITAL	39	60	28	967	25	217	1336

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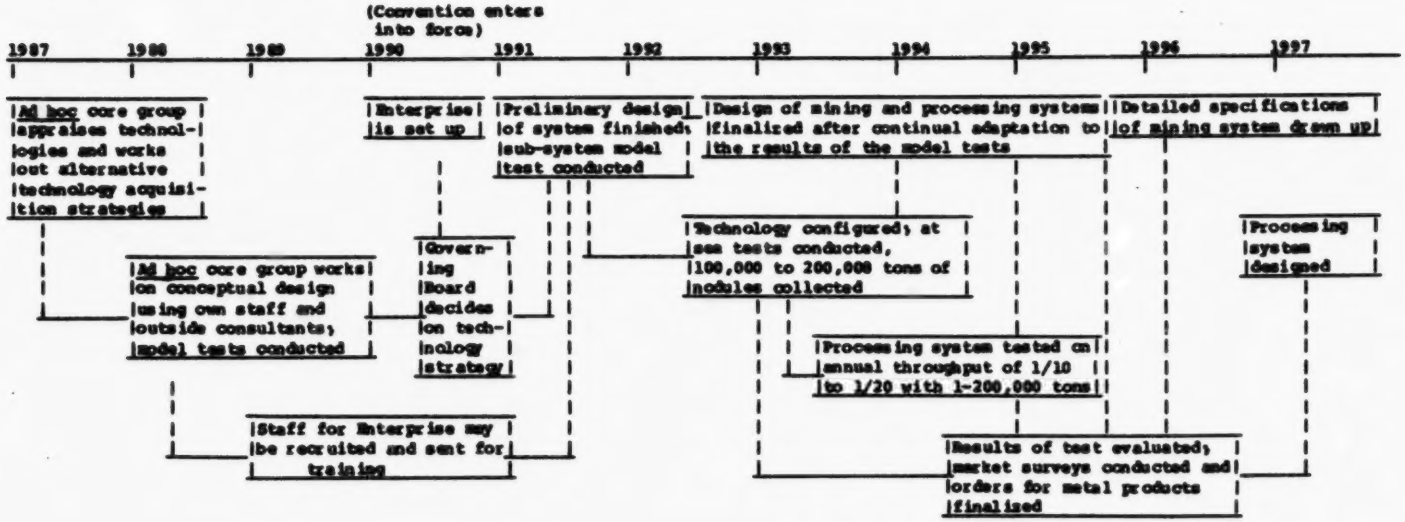
Table 38: Pre-investment flows when mining is by lease and processing is by the Enterprise


(Convention enters into force)
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
Ad hoc core group appraises technologies and works out alternative technology acquisition strategies
Ad hoc core group works on conceptual design using own staff and outside consultants; model tests conducted
Staff for Enterprise may be recruited and sent for training
Enterprise is set up
Governing Board decides on technology strategy
Preliminary design of system finished; sub-system model test conducted
Design of mining and processing systems finalized after continual adaptation to the results of the model tests
Technology configured; at sea tests conducted, 100,000 to 200,000 tons of nodules collected
Processing system tested on annual throughput of 1/10 to 1/20 with 1-200,000 tons
Results of test evaluated; market surveys conducted and orders for metal products finalized
Detailed specifications of mining system drawn up
Processing system designed

Manpower flow										
Managerial and design	4	4	99	136	136	148	148	160	160	151
Operative & support	4	4	15	19	19	24	24	48	48	28
Funds flow (millions 1980 US$)										
R&D, testing						-6	-13	-14	-14	-14
Exploration		-3*	-3*	-3*						
Costs of manpower	-1**	-1**	-7	-9	-9	-10	-10	-12	-12	-10
Total annual flow	-1	-4	-10	-12	-9	-16	-23	-26	-26	-24

Accumulated total cash flow: -151

* Exploration costs will be incurred by pioneer investors on a re-imbursable basis.

** Includes salaries and wages of experts, costs of using outside consultants and other overhead expenses.

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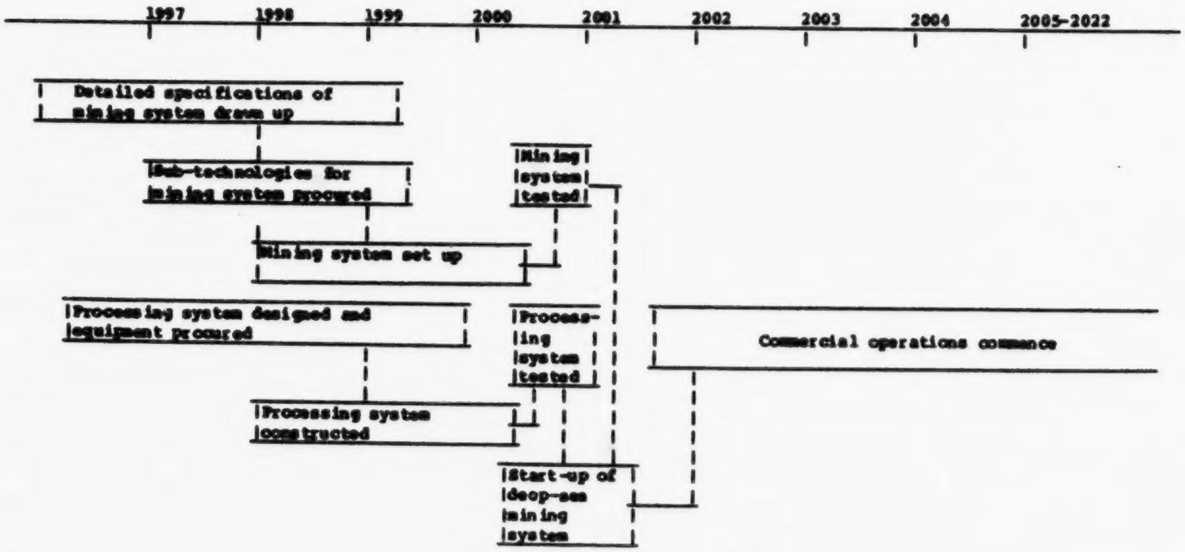
Table 3C: Post-investment flows when mining is by lease and processing is by the Enterprise



	1997	1998	1999	2000	2001	2002	2003	2004	2005-2022
Manpower flows									
Managerial and design	151	151	151	200	225	225	225	225	225
Operative and support	28	49	49	159	1000	1600	1600	1600	1600
Funds flow (millions 1980 USD)									
Capital (-)	-48	-129	-397	-437					
Operating (-)					-261	-522	-522	-522	-522 every year
Revenues (+)					174	1045	1045	1045	1045 every year
Yearly total	-48	-129	-397	-437	-87	523	523	523	523 every year
Accumulated flow from pre-investment stage	-151								
Cumulative cash flow	-199	-328	-725	-1162	-1249	-726	-203	320	9385 by year 2021

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Table 3D: Simplified operating cash flow when mining is by lease and processing is by the Enterprise

(Millions of 1980 US dollars)

	1987-1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006-2020	2021
Capital costs	-151	-48	-129	-397	-437	-	-	-	-	-	-	-
Operating costs	-	-	-	-	-	-261	-522	-522	-522	-522	-522	-348
Revenues	-	-	-	-	-	174	1045	1045	1045	1045	1045	1045
Operating Income	-151	-48	-129	-397	-437	-87	523	523	523	523	523	697
Cumulative Operating income	-151	-199	-328	-725	-1162	-1249	-726	-203	320	843	8688	9385

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Table 4A: Requirements of funds and manpower where both mining and processing are by lease

Manpower

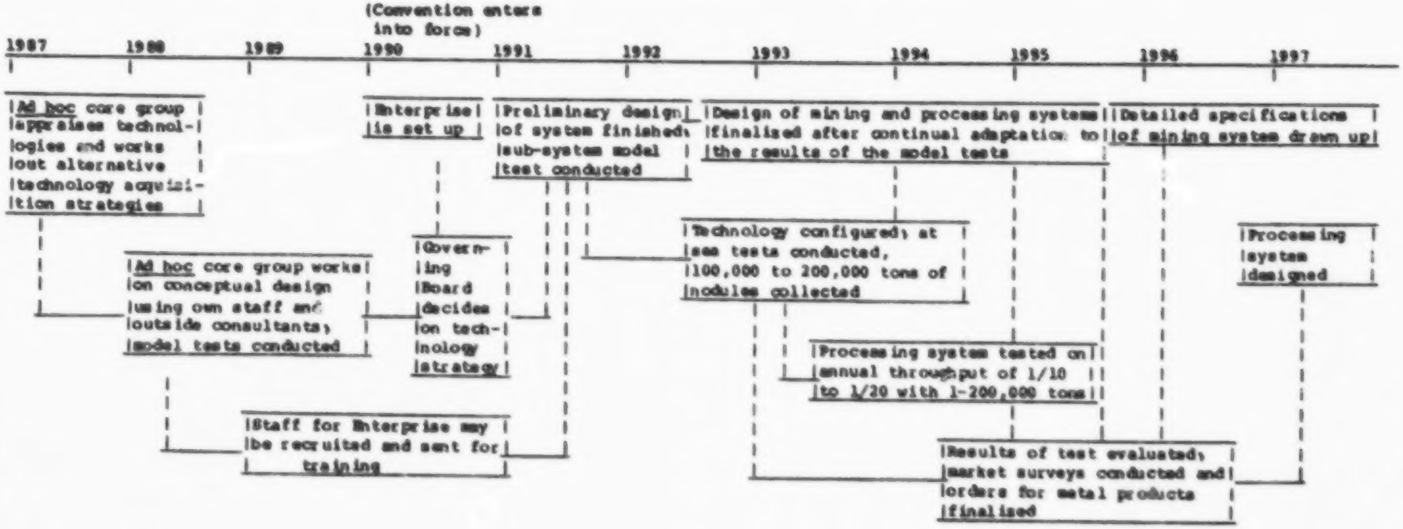
Type of manpower	1987-1988	1989	1990-1991	1992-1993	1994-1995	1996-1997	1998-1999	2000	2001	2002 2021
Managerial	4	8	10	12	14	15	15	24	29	29
Engineering										
Mining		36	50	55	60	55	55	75	85	85
Processing		36	50	55	60	55	55	75	85	85
Scientific		19	26	26	26	26	26	26	26	26
Subtotal: Managerial and technical	4	99	136	148	160	151	151	200	225	225
Personnel										
Support	4	15	19	24	27	28	28	28	40	46
Operating	-	-	-	-	21	-	21	131	960	1554
Subtotal: Support and operating	4	15	19	24	48	28	49	159	1000	1600
TOTAL	8	114	155	172	208	179	200	359	1225	1825

Total cost of manpower (1987-2000) = $US 129 million (1980)

Funds (millions of 1980 US dollars)

	ACTIVITY						
	Mining	On-sea trans-portation	On-land activities	Process-ing	Admin.+ Sales	Prepara-tory (+manpower)	TOTAL
Capital	-	50	-	-	10	156	216
Operating	75	30	55	245	45	-	450
Lease	42	-	30	94	-	-	166
Working capital 1/3 (Operating plus lease)	39	10	28	113	15		205
TOTAL CAPITAL	39	60	28	113	25	156	421

Table 48: Pre-investment flows when both mining and processing are by lease


(Convention enters into force)
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
Ad hoc core group appraises technologies and works out alternative technology acquisition strategies
Ad hoc core group works on conceptual design using own staff and outside consultants; model tests conducted
Enterprise is set up
Governing Board decides on technology strategy
Staff for Enterprise may be recruited and sent for training
Preliminary design of system finished; sub-system model test conducted
Design of mining and processing systems finalized after continual adaptation to the results of the model tests
Technology configured; at sea tests conducted, 100,000 to 200,000 tons of nodules collected
Processing system tested on annual throughput of 1/10 to 1/20 with 1-200,000 tons
Results of test evaluated; market surveys conducted and orders for metal products finalized
Detailed specifications of mining system drawn up
Processing system designed

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Manpower flow										
Managerial and design	4	4	99	136	136	148	148	160	160	151
Operative & support	4	4	15	19	19	24	24	48	48	28
Funds flow (millions 1980 US$) R&D, testing										
Exploration		-3*	-3*	-3*						
Costs of manpower	-1**	-1**	-7	-9	-9	-10	-10	-12	-12	-10
Total annual flow	-1	-4	-10	-12	-9	-10	-10	-12	-12	-10

Accumulated total cash flow: -90

* Exploration costs will be incurred by pioneer investors on a re-imbursable basis.

** Includes salaries and wages of experts, costs of using outside consultants and other overhead expenses.

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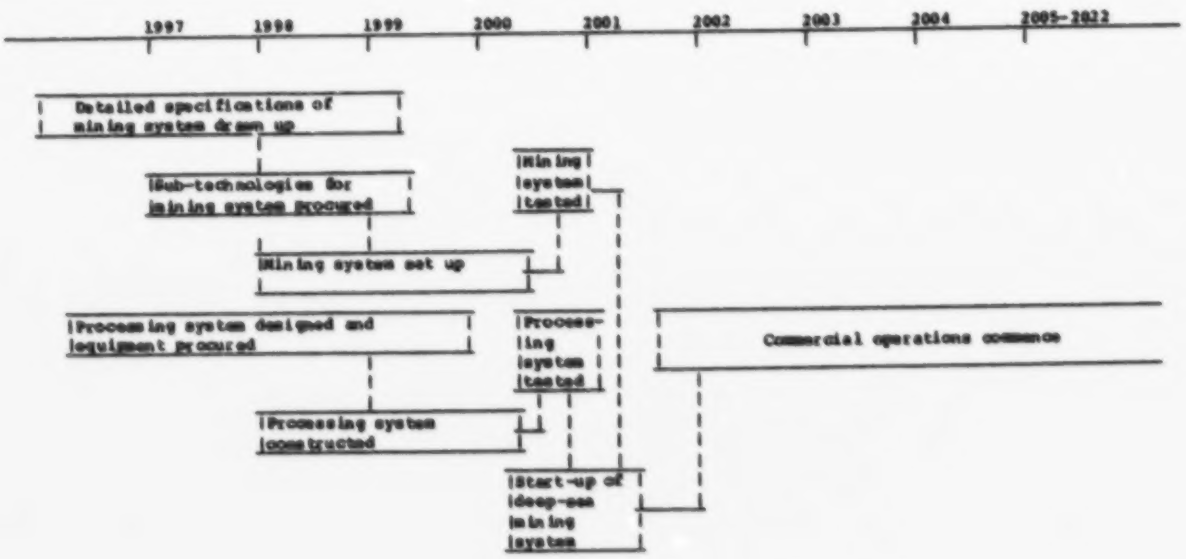
Table 4C: Post-investment flows when both mining and processing are by lease


1997
1998
1999
2000
2001
2002
2003
2004
2005-2022
Detailed specifications of mining system drawn up
Sub-technologies for mining system procured
Mining system set up
Mining system tested
Processing system designed and equipment procured
Processing system constructed
Processing system tested
Start-up of deep-sea mining system
Commercial operations commence

	1997	1998	1999	2000	2001	2002	2003	2004	2005-2022
Manpower flows									
Managerial and design	151	151	151	200	225	225	225	225	225
Operative and support	28	49	49	159	1000	1600	1600	1600	1600
Funds flow (millions 1980 US$)									
Capital (-)	-23	-14	-37	-52					
Operating (-)					-308	-616	-616	-616	-616 every year
Revenues (+)					174	1045	1045	1045	1045 every year
Yearly total	-23	-14	-37	-52	-134	429	429	429	429 every year
Accumulated flow from pre-investment stage:	-90								
Cumulative cash flow	-113	-127	-164	-216	-350	79	508	937	8435 by year 2021

/...

Table 4D: Simplified operating cash flow when both mining and processing are by lease

(Millions of 1980 US dollars)

	1987-1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006-2020	2021
Capital costs	-90	-23	-14	-37	-52	-	-	-	-	-	-	-
Operating costs	-	-	-	-	-	-308	-616	-616	-616	-616	-616	-411
Revenues	-	-	-	-	-	174	1045	1045	1045	1045	1045	1045
Operating Income	-90	-23	-14	-37	-52	-134	429	429	429	429	429	634
Cumulative Operating income	-90	-113	-127	-164	-216	-350	79	508	937	1366	7801	8435

/...

Table 5A: Requirements of funds and manpower where mining is by the Enterprise and processing is by joint venture

Manpower

Type of manpower	1987-1988	1989	1990-1991	1992-1993	1994-1995	1996-1997	1998-1999	2000	2001	2002 2021
Managerial	4	8	10	12	14	15	15	24	29	29
Engineering										
Mining		36	50	55	60	55	55	75	85	85
Processing		10	10	10	40	40	40	60	70	70
Scientific		19	26	26	26	26	26	26	26	26
Subtotal: Managerial and technical	4	73	96	103	140	136	136	185	210	210
Personnel										
Support	4	10	15	16	24	24	24	29	40	46
Operating	-	-	-	-	21	-	21	131	960	1554
Subtotal: Support and operating	4	10	15	16	45	24	45	160	1000	1600
TOTAL	8	83	111	119	185	160	181	345	1210	1810

Total cost of manpower (1987-2000) = $US 113 million (1980)

Funds (millions of 1980 US dollars)

	ACTIVITY						
	Mining	On-sea transportation	On-land activities	Processing	Admin.+ Sales	Preparatory (manpower)	TOTAL
Capital	360	50	-	442	10	233	1095
Operating	75	30	28	122	30	-	285
Lease	-	-	15	-	-	-	15
Working capital 1/3 (Operating plus lease)	25	10	14	41	10	-	100
TOTAL CAPITAL	385	60	14	983	20	233	1195

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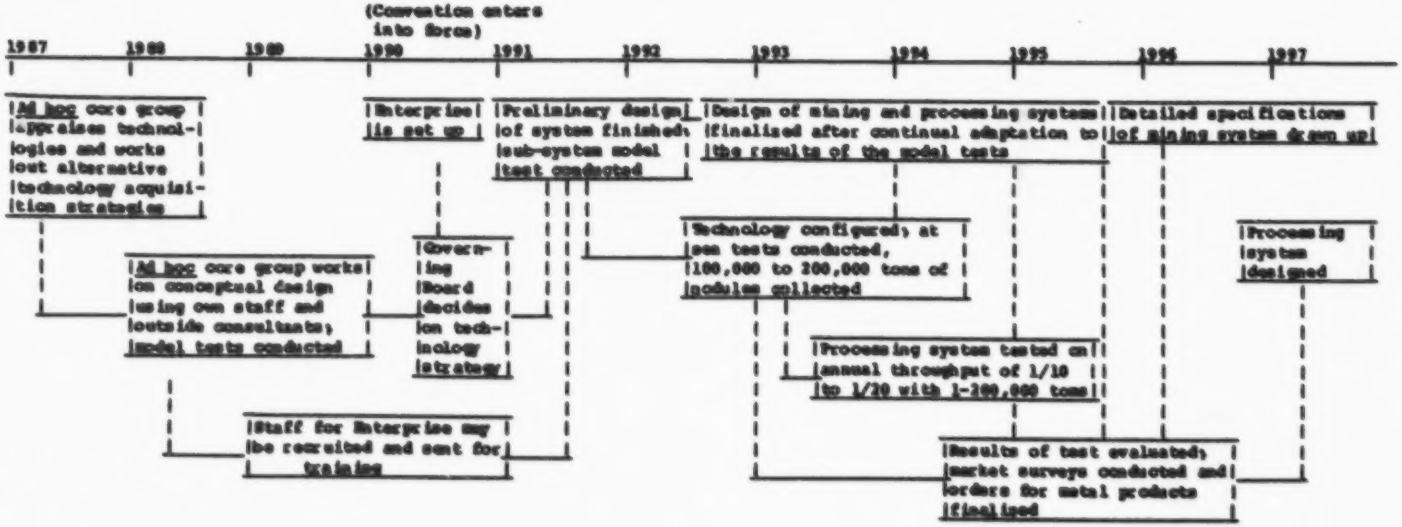
Table 58: Pre-investment flows when mining is by the Enterprise and processing is by joint venture


(Convention enters into force)
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
Ad hoc core group appraises technologies and works out alternative technology acquisition strategies
Enterprise is set up
Preliminary design of system finished, sub-system model test conducted
Design of mining and processing systems finalized after continual adaptation to the results of the model tests
Detailed specifications of mining system drawn up
Ad hoc core group works on conceptual design using own staff and outside consultants, model tests conducted
Governing Board decides on technology strategy
Technology configured, at sea tests conducted, 100,000 to 200,000 tons of nodules collected
Processing system designed
Processing system tested on annual throughput of 1/10 to 1/20 with 1-200,000 tons
Staff for Enterprise may be recruited and sent for training
Results of test evaluated, market surveys conducted and orders for metal products finalized

Manpower flow										
Managerial and design	4	4	73	96	96	103	103	140	140	136
Operative & support	4	4	10	15	15	16	16	45	45	34
Funds flow (millions 1980 US$)										
R&D, testing						-9	-21	-21	-21	-21
Exploration		-3*	-3*	-3*						
Costs of manpower	-1**	-1**	-6	-7	-7	-7	-7	-11	-11	-9
Total annual flow	-1	-4	-9	-10	-7	-16	-28	-32	-32	-30

Accumulated total cash flow: -169

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* Exploration costs will be incurred by pioneer investors on a re-imbursable basis.

** Includes salaries and wages of experts, costs of using outside consultants and other overhead expenses.

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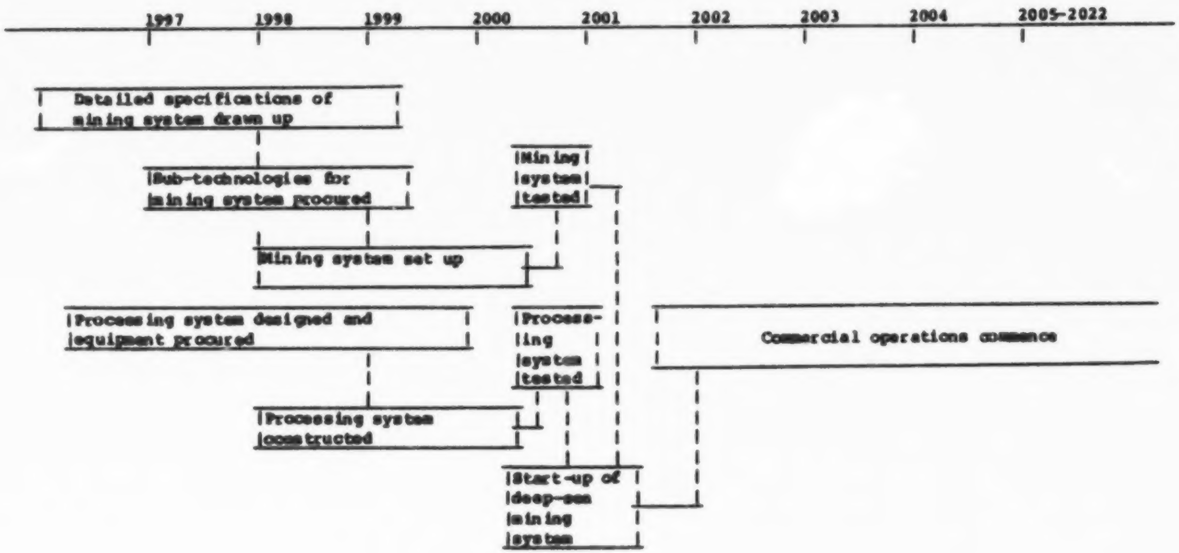
Table 5C: Post-investment flows when mining is by the Enterprise and processing is by joint venture


1997
1998
1999
2000
2001
2002
2003
2004
2005-2022
Detailed specifications of mining system drawn up
Sub-technologies for mining system procured
Mining system tested
Mining system set up
Processing system designed and equipment procured
Processing system tested
Commercial operations commence
Processing system constructed
Start-up of deep-sea mining system

	1997	1998	1999	2000	2001	2002	2003	2004	2005-2022
Manpower flows									
Managerial and design	136	136	136	185	210	210	210	210	210
Operative and support	24	45	45	160	1000	1600	1600	1600	1600
Funds flow (millions 1980 US$)									
Capital (-)	-78	-142	-355	-351					
Operating (-)					-150	-300	-300	-300	-300 every year
Revenues (+)					116	695	695	695	695 every year
Yearly total	-78	-142	-355	-351	-34	395	395	395	395 every year
Accumulated flow from pre-investment stage:	-169								
Cumulative cash flow	-247	-389	-744	-1095	-1129	-734	-339	56	6871 by year 2021

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Table 5D: Simplified operating cash flow when mining is by the Enterprise and processing is by joint venture

(Millions of 1980 US dollars)

	1987-1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006-2020	2021
Capital costs	-169	-78	-142	-355	-351	-	-	-	-	-	-	-
Operating costs	-	-	-	-	-	-150	-300	-300	-300	-300	-300	-200
Revenues	-	-	-	-	-	116	695	695	695	695	695	695
Operating Income	-169	-78	-142	-355	-351	-34	395	395	395	395	395	495
Cumulative Operating income	-169	-247	-389	-744	-1095	-1129	-734	-339	56	451	6376	6871

Table 6A: Requirements of funds and manpower where mining is by joint venture and processing is by the Enterprise

Manpower

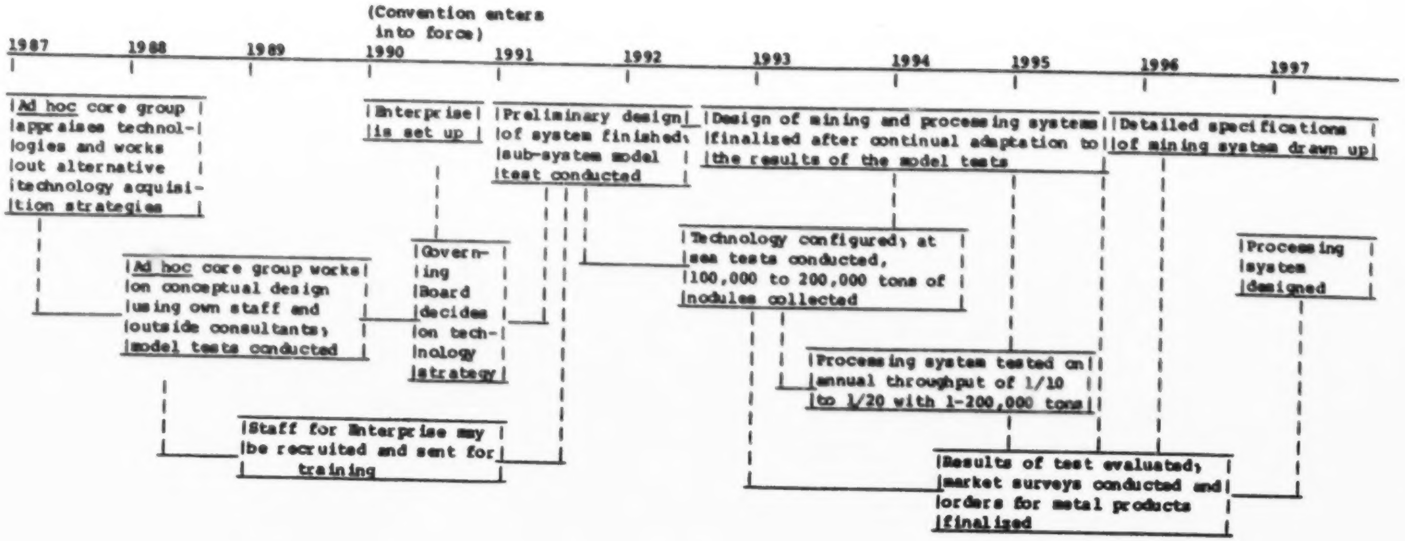
Type of manpower	1987-1988	1989	1990-1991	1992-1993	1994-1995	1996-1997	1998-1999	2000	2001	2002 2021
Managerial	4	8	10	12	14	15	15	24	29	29
Engineering										
Mining		10	10	10	40	40	40	60	70	70
Processing		36	50	55	60	55	55	75	85	85
Scientific		19	26	26	26	26	26	26	26	26
Subtotal: Managerial and technical	4	73	96	103	140	136	136	185	210	210
Personnel										
Support	4	10	15	16	24	24	24	29	40	46
Operating	-	-	-	-	21	-	21	131	960	1554
Subtotal: Support and operating	4	10	15	16	45	24	45	160	1000	1600
TOTAL	8	83	111	119	185	160	181	345	1210	1810

Total cost of manpower (1987-2000) = $US 113 million (1980)

Funds (millions of 1980 US dollars)

	ACTIVITY						
	Mining	On-sea trans-portation	On-land activities	Process-ing	Admin.+ Sales	Prepara-tory (+manpower)	TOTAL
Capital	180	50	-	885	10	219	1344
Operating	37	30	55	245	39	-	406
Lease	-	-	30	-	-	-	30
Working capital 1/3 (Operating plus lease)	12	10	28	82	13	-	145
TOTAL CAPITAL	192	60	28	967	23	219	1489

Table 6B: Pre-investment flows when mining is by joint venture and processing is by the Enterprise


(Convention enters into force)
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
Ad hoc core group appraises technologies and works out alternative technology acquisition strategies
Ad hoc core group works on conceptual design using own staff and outside consultants; model tests conducted
Staff for Enterprise may be recruited and sent for training
Enterprise is set up
Governing Board decides on technology strategy
Preliminary design of system finished; sub-system model test conducted
Design of mining and processing systems finalized after continual adaptation to the results of the model tests
Technology configured; at sea tests conducted, 100,000 to 200,000 tons of nodules collected
Processing system tested on annual throughput of 1/10 to 1/20 with 1-200,000 tons
Results of test evaluated; market surveys conducted and orders for metal products finalized
Detailed specifications of mining system drawn up
Processing system designed

Manpower flow										
Managerial and design	4	4	73	96	96	103	103	140	140	136
Operative & support	4	4	10	15	15	16	16	45	45	24
Funds flow (millions 1980 US$)										
R&D, testing						-9	-21	-21	-21	-21
Exploration		-1*	-2*	-1*						
Costs of manpower	-1**	-1**	-6	-7	-7	-7	-7	-11	-11	-9
Total annual flow	-1	-2	-8	-8	-7	-16	-28	-32	-32	-30

Accumulated total cash flow: -164

* Exploration costs will be incurred by pioneer investors on a re-imburseable basis.
** Includes salaries and wages of experts, costs of using outside consultants and other overhead expenses.

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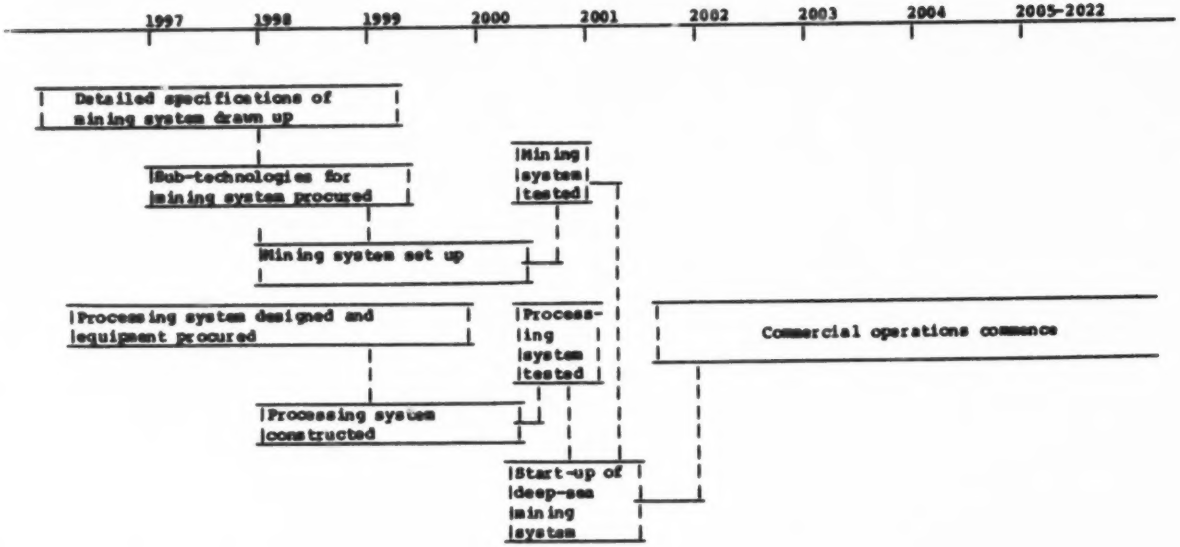
Table 6C: Post-investment flows when mining is by joint venture and processing is by the Enterprise


1997
1998
1999
2000
2001
2002
2003
2004
2005-2022
Detailed specifications of mining system drawn up
Sub-technologies for mining system procured
Mining system tested
Mining system set up
Processing system designed and equipment procured
Processing system tested
Commercial operations commence
Processing system constructed
Start-up of deep-sea mining system

	1997	1998	1999	2000	2001	2002	2003	2004	2005-2022
Manpower flows									
Managerial and design	136	136	136	185	210	210	210	210	210
Operative and support	24	45	45	160	1000	1600	1600	1600	1600
Funds flow (millions 1980 US$)									
Capital (-)	-67	-163	-463	-487					
Operating (-)					-218	-436	-436	-436	-436 every year
Revenues (+)					150	902	902	902	902 every year
Yearly total	-67	-163	-463	-487	-68	466	466	466	466 every year
Accumulated flow from pre-investment stage:	-164								
Cumulative cash flow	-231	-394	-857	-1344	-1412	-946	-480	-14	8053 by year 2021

/...

Table 6D: Simplified operating cash flow when mining is by joint venture and processing is by the Enterprise

(Millions of 1980 US dollars)

	1987–1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006–2020	2021
Capital costs	-164	-67	-163	-463	-487	-	-	-	-	-	-	-
Operating costs	-	-	-	-	-	-218	-436	-436	-436	-436	-436	-291
Revenues	-	-	-	-	-	150	902	902	902	902	902	902
Operating Income	-164	-67	-163	-463	-487	-68	466	466	466	466	466	611
Cumulative Operating income	-164	-231	-394	-857	-1344	-1412	-946	-480	-14	452	7442	8053

Table 7A: Requirements of funds and manpower where mining is by lease and processing is by joint venture

Manpower

Type of manpower	1987-1988	1989	1990-1991	1992-1993	1994-1995	1996-1997	1998-1999	2000	2001	2002-2021
Managerial	4	8	10	12	14	15	15	24	29	29
Engineering										
Mining		36	50	55	60	55	55	75	85	85
Processing		10	10	10	40	40	40	60	70	70
Scientific		19	26	26	26	26	26	26	26	26
Subtotal: Managerial and technical	4	73	96	103	140	136	136	185	210	210
Personnel										
Support	4	10	15	16	24	24	24	29	40	46
Operating	-	-	-	-	21	-	21	131	960	1554
Subtotal: Support and operating	4	10	15	16	45	24	45	160	1000	1600
TOTAL	8	83	111	119	185	160	181	345	1210	1810

Total cost of manpower (1987-2000) = $US 113 million (1980)

Funds (millions of 1980 US dollars)

	ACTIVITY						
	Mining	On-sea transportation	On-land activities	Processing	Admin.+ Sales	Preparatory (+manpower)	TOTAL
Capital	-	50	-	442	10	171	673
Operating	75	30	27	122	30	-	284
Lease	42	-	15	-	-	-	57
Working capital 1/3 (Operating plus lease)	39	10	14	41	10	-	114
TOTAL CAPITAL	39	60	14	483	20	171	787

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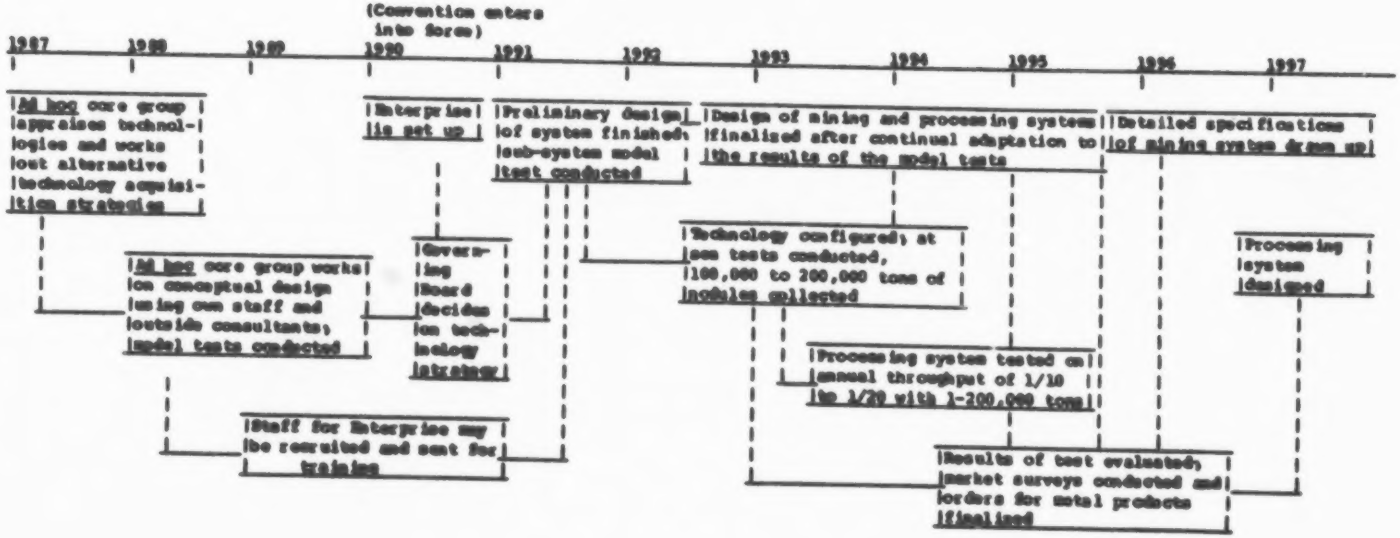
Table 7B: Pre-investment flows when mining is by lease and and processing is by joint venture


(Convention enters into force)
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
Ad hoc core group appraises technologies and works out alternative technology acquisition strategies
Enterprise is set up
Preliminary design of system finished; sub-system model test conducted
Design of mining and processing systems finalized after continual adaptation to the results of the model tests
Detailed specifications of mining system drawn up
Ad hoc core group works on conceptual design using own staff and outside consultants; model tests conducted
Governing Board decides on technology strategy
Technology configured; at sea tests conducted, 100,000 to 200,000 tons of nodules collected
Processing system designed
Staff for Enterprise may be recruited and sent for training
Processing system tested on annual throughput of 1/10 to 1/20 with 1-200,000 tons
Results of test evaluated, market surveys conducted and orders for metal products finalized

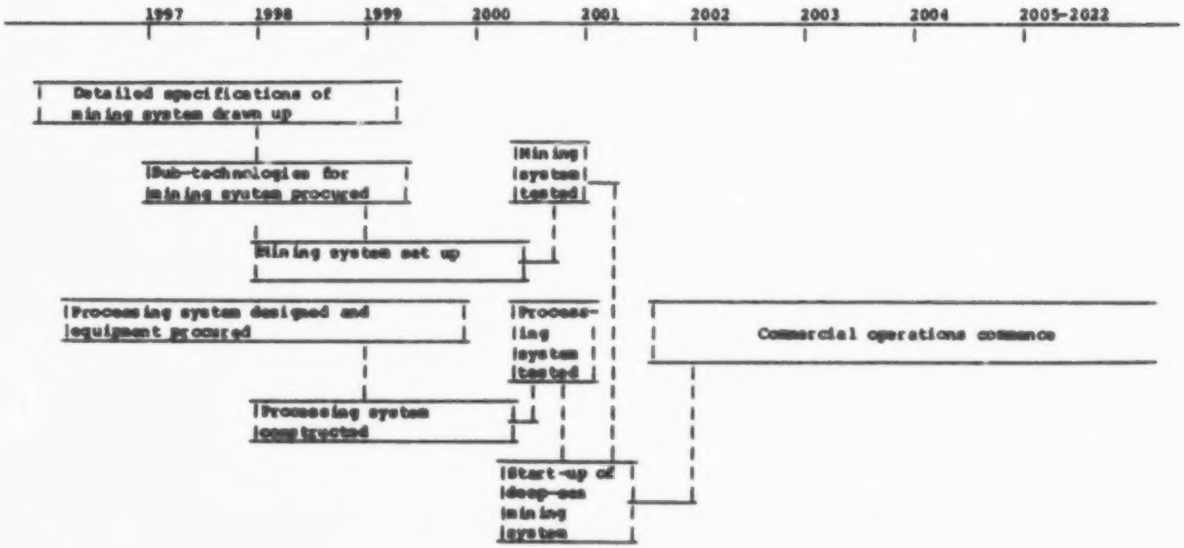
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Manpower flow										
Managerial and design	4	4	73	96	96	103	103	140	140	136
Operative & support	4	4	10	15	15	16	16	45	45	34
Funds flow (millions 1980 US$)										
R&D, testing						-3	-7	-7	-7	-7
Exploration		-1*	-2*	-1*						
Costs of manpower	-1**	-1**	-6	-7	-7	-7	-7	-11	-11	-9
Total annual flow	-1	-4	-9	-10	-7	-10	-14	-18	-18	-16

Accumulated total cash flow: -107

* Exploration costs will be incurred by pioneer investors on a re-imbursable basis.
** Includes salaries and wages of experts, costs of using outside consultants and other overhead expenses.

/...

Table 7C: Post-investment flows when mining is by lease and processing is by joint venture


1997
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2000
2001
2002
2003
2004
2005-2022
Detailed specifications of mining system drawn up
Sub-technologies for mining system procured
Mining system set up
Mining system tested
Processing system designed and equipment procured
Processing system constructed
Process-ing system tested
Start-up of deep-sea mining system
Commercial operations commence

	1997	1998	1999	2000	2001	2002	2003	2004	2005-2022
Manpower flows									
Managerial and design	136	136	136	185	210	210	210	210	210
Operative and support	24	45	45	160	1000	1600	1600	1600	1600
Funds flow (millions 1980 US$)									
Capital (-)	-34	-72	-217	-243					
Operating (-)					-170	-341	-341	-341	-341 every year
Revenues (+)					116	695	695	695	695 every year
Yearly total	-34	-72	-217	-243	-54	354	354	354	354 every year
Accumulated flow from pre-investment stage:	-107								
Cumulative cash flow	-141	-213	-430	-673	-727	-373	-19	335	6467 by year 2021

/...

Table 7D: Simplified operating cash flow when mining is by lease and processing is by joint venture

(Millions of 1980 US dollars)

	1987-1996	1997	1988	1999	2000	2001	2002	2003	2004	2005	2006-2020	2021
Capital costs	-107	-34	-72	-217	-243	-	-	-	-	-	-	-
Operating costs	-	-	-	-	-	-170	-341	-341	-341	-341	-341	-227
Revenues	-	-	-	-	-	116	695	695	695	695	695	695
Operating Income	-107	-34	-72	-217	-243	-54	354	354	354	354	354	468
Cumulative Operating income	-107	-141	-213	-430	-673	-727	-373	-19	335	689	5999	6467

/...

Table 8A: Requirements of funds and manpower where mining is by joint venture and processing is by lease

Manpower

Type of manpower	1987-1988	1989	1990-1991	1992-1993	1994-1995	1996-1997	1998-1999	2000	2001	2002 2021
Managerial	4	8	10	12	14	15	15	24	29	29
Engineering										
Mining		10	10	10	40	40	40	60	70	70
Processing		36	50	55	60	55	55	75	85	85
Scientific		19	26	26	26	26	26	26	26	26
Subtotal: Managerial and technical	4	73	96	103	140	136	136	185	210	210
Personnel										
Support	4	10	15	16	24	24	24	29	40	46
Operating	-	-	-	-	21	-	21	131	960	1554
Subtotal: Support and operating	4	10	15	16	45	24	45	160	1000	1600
TOTAL	8	83	111	119	185	160	181	365	1210	1810

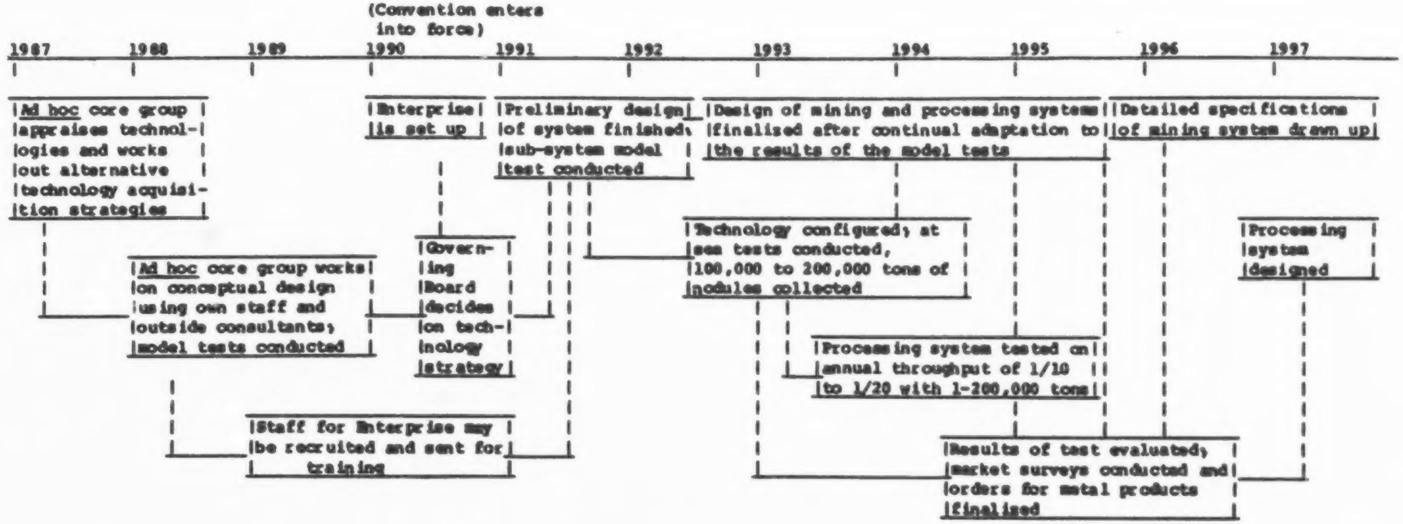
Total cost of manpower (1987-2000) = $US 113 million (1980)

Funds (millions of 1980 US dollars)

	ACTIVITY						
	Mining	On-sea trans-portation	On-land activities	Process-ing	Admin.+ Sales	Prepara-tory (+manpower)	TOTAL
Capital	180	50	-	-	10	157	397
Operating	37	30	55	245	39	-	406
Lease	-	-	30	94	-	-	124
Working capital 1/3 (Operating plus lease)	12	10	28	113	13	-	176
TOTAL CAPITAL	192	60	28	113	23	157	573

/...

Table 8B: Pre-investment flows when mining is by joint venture and processing is by lease


(Convention enters into force)
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
Ad hoc core group appraises technologies and works out alternative technology acquisition strategies
Ad hoc core group works on conceptual design using own staff and outside consultants; model tests conducted
Staff for Enterprise may be recruited and sent for training
Enterprise is set up
Governing Board decides on technology strategy
Preliminary design of system finished; sub-system model test conducted
Design of mining and processing systems finalized after continual adaptation to the results of the model tests
Technology configured; at sea tests conducted, 100,000 to 200,000 tons of nodules collected
Processing system tested on annual throughput of 1/10 to 1/20 with 1-200,000 tons
Results of test evaluated; market surveys conducted and orders for metal products finalized
Detailed specifications of mining system drawn up
Processing system designed

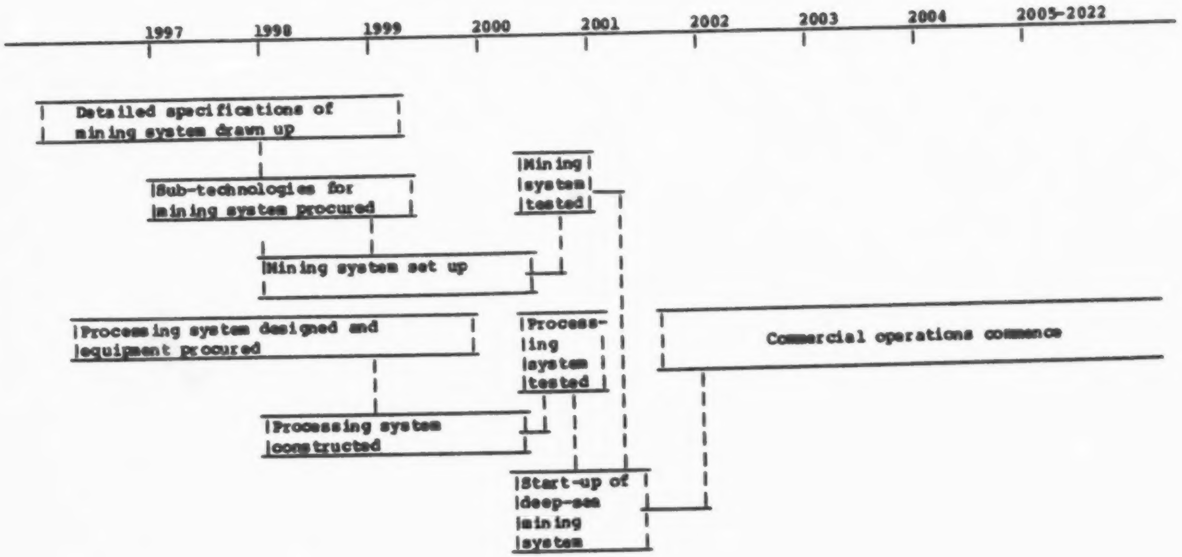
Manpower flow										
Managerial and design	4	4	73	96	96	103	103	140	140	136
Operative & support	4	4	10	15	15	16	16	45	45	24
Funds flow (millions 1980 US$)										
R&D, testing						-3	-7	-7	-7	-7
Exploration		-1*	-2*	-1*						
Costs of manpower	-1**	-1**	-6	-7	-7	-7	-7	-11	-11	-9
Total annual flow	-1	-2	-8	-8	-7	-10	-14	-18	-18	-16

Accumulated total cash flow: -102

* Exploration costs will be incurred by pioneer investors on a re-imbursable basis.
** Includes salaries and wages of experts, costs of using outside consultants and other overhead expenses.

/...

Table 8C: Post-investment flows when mining is by joint venture and processing is by lease


1997
1998
1999
2000
2001
2002
2003
2004
2005-2022
Detailed specifications of mining system drawn up
Sub-technologies for mining system procured
Mining system set up
Mining system tested
Processing system designed and equipment procured
Processing system constructed
Processing system tested
Start-up of deep-sea mining system
Commercial operations commence

	1997	1998	1999	2000	2001	2002	2003	2004	2005-2022
Manpower flows									
Managerial and design	136	136	136	185	210	210	210	210	210
Operative and support	24	45	45	160	1000	1600	1600	1600	1600
Funds flow (millions 1980 US$)									
Capital (-)	-42	-48	-103	-102	-265	-530	-530	-530	-530 every year
Operating (-)					150	902	902	902	902 every year
Revenues (+)									
Total	-42	-48	-103	-102	-115	372	372	372	372 every year
Accumulated flow from pre-investment stage	-102								
Cumulative cash flow	-144	-192	-295	-397	-512	-140	232	604	7105 by year 2021

/...

Table 8D: Simplified operating cash flow when mining is by joint venture and processing is by lease

(Millions of 1980 US dollars)

	1987-1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006-2020	2021
Capital costs	-102	-42	-48	-103	-102	-	-	-	-	-	-	-
Operating costs	-	-	-	-	-	-265	-530	-530	-530	-530	-530	-353
Revenues	-	-	-	-	-	150	902	902	902	902	902	902
Operating Income	-102	-42	-48	-103	-102	-115	372	372	372	372	372	549
Cumulative Operating income	-102	-144	-192	-295	-397	-512	-140	232	604	976	6556	7105

/...

Table 9A: Requirements of funds and manpower where both mining and processing is by joint venture

Manpower

Type of manpower	1987-1988	1989	1990-1991	1992-1993	1994-1995	1996-1997	1998-1999	2000	2001	2002 2021
Managerial	4	4	4	4	11	14	14	20	29	29
Engineering										
Mining		10	10	10	40	40	40	60	70	70
Processing		10	10	10	40	40	40	60	70	70
Scientific		4	4	4	9	9	9	9	9	9
Subtotal: Managerial and technical	4	28	28	28	100	103	103	149	178	178
Personnel										
Support	4	8	8	8	14	23	23	30	40	46
Operating	-	-	-	-	21	-	21	131	960	1554
Subtotal: Support and operating	4	8	8	8	35	23	44	161	1000	1600
TOTAL	8	36	36	36	135	126	147	310	1178	1778

Total cost of manpower (1987-2000) = $US 79 million (1980)

Funds (millions of 1980 US dollars)

	ACTIVITY						
	Mining	On-sea transportation	On-land activities	Processing	Admin.+ Sales	Preparatory (+manpower)	TOTAL
Capital	180	50	-	442	5	154	831
Operating	37	30	27	122	23	-	240
Lease	-	-	15	-	-	-	15
Working capital 1/3 (Operating plus lease)	12	10	14	41	8	-	85
TOTAL CAPITAL	192	60	14	483	13	154	916

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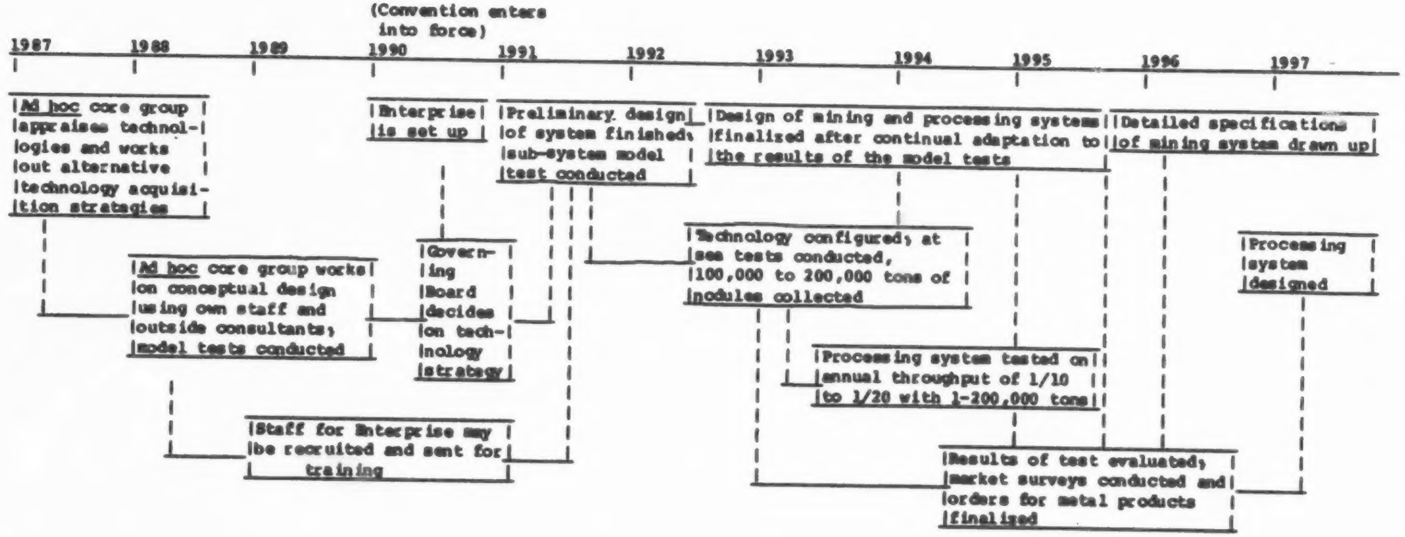
Table 9B: Pre-investment flows when mining both mining and processing are by joint venture


(Convention enters into force)
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
Ad hoc core group appraises technologies and works out alternative technology acquisition strategies
Ad hoc core group works on conceptual design using own staff and outside consultants; model tests conducted
Enterprise is set up
Governing Board decides on technology strategy
Staff for Enterprise may be recruited and sent for training
Preliminary design of system finished; sub-system model test conducted
Design of mining and processing systems finalized after continual adaptation to the results of the model tests
Technology configured; at sea tests conducted, 100,000 to 200,000 tons of nodules collected
Processing system tested on annual throughput of 1/10 to 1/20 with 1-200,000 tons
Detailed specifications of mining system drawn up
Results of test evaluated; market surveys conducted and orders for metal products finalized
Processing system designed

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Manpower flow										
Managerial and design	4	4	28	28	28	28	28	100	100	103
Operative & support	4	4	8	8	8	8	8	35	35	23
Funds flow (millions 1980 US$)										
R&D, testing						-6	-14	-14	-14	-14
Exploration		-1*	-2*	-1*						
Costs of manpower	-1**	-1**	-3	-3	-3	-3	-3	-8	-8	-8
Total annual flow	-1	-2	-5	-4	-3	-9	-17	-22	-22	-22

Accumulated total cash flow: -107

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* Exploration costs will be incurred by pioneer investors on a re-imbursable basis.

** Includes salaries and wages of experts, costs of using outside consultants and other overhead expenses.

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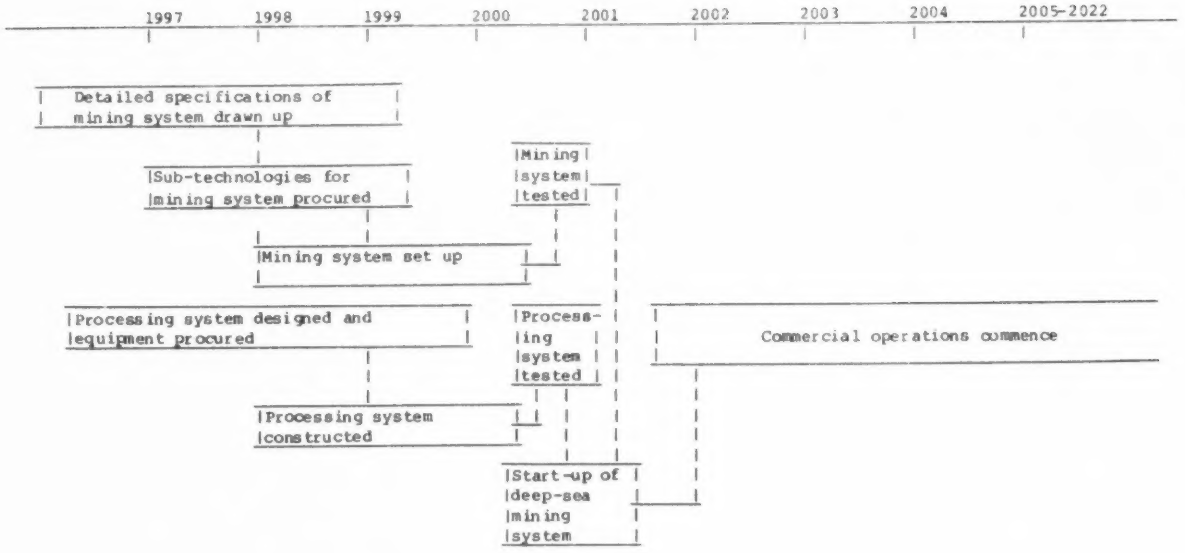
Table 9C: Post-investment flows when both mining and processing are by joint venture


1997
1998
1999
2000
2001
2002
2003
2004
2005–2022
Detailed specifications of mining system drawn up
Sub-technologies for mining system procured
Mining system set up
Mining system tested
Processing system designed and equipment procured
Processing system tested
Processing system constructed
Start-up of deep-sea mining system
Commercial operations commence

	1997	1998	1999	2000	2001	2002	2003	2004	2005–2022
Manpower flows									
Managerial and design	103	103	103	169	178	178	178	178	178
Operative and support	23	44	44	161	1000	1600	1600	1600	1600
Funds flow (millions 1980 US$)									
Capital (-)	-48	-104	-281	-291					
Operating (-)					-127	-255	-255	-255	-255 every year
Revenues (+)					92	552	552	552	552 every year
Total	-48	-104	-281	-291	-35	297	297	297	297 every year
Accumulated flow from pre-investment stage	-107								
Cumulative cash flow	-155	-259	-540	-831	-866	-569	-272	25	5159 by year 2021

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Table 9D: Simplified operating cash flow when both mining and processing are by joint venture

(Millions of 1980 US dollars)

	1987-1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006-2020	2021
Capital costs	-107	-48	-104	-281	-291	-	-	-	-	-	-	-
Operating costs	-	-	-	-	-	-127	-255	-255	-255	-255	-255	-170
Revenues	-	-	-	-	-	92	552	552	552	552	552	552
Operating Income	-107	-48	-104	-281	-291	-35	297	297	297	297	297	382
Cumulative Operating income	-107	-155	-259	-540	-831	-866	-569	-272	25	322	4777	5159

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LOS/PCN/SCN.2/WP.6/Add.1
18 June 1985

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEA-BED AUTHORITY
AND FOR THE INTERNATIONAL TRIBUNAL
FOR THE LAW OF THE SEA
Special Commission 2

PROJECT PROFILE OF A DEEP-SEA-BED MINING OPERATION BY THE ENTERPRISE

Working paper by the Secretariat

Addendum

Introduction

1. In the course of the discussions on document LOS/PCN/SCN.2/WP.6, presented at the third session of the Preparatory Commission, a number of delegations indicated that they would be conducting expert appraisals of the working paper, in order to hold more in-depth discussions at the next meetings of Special Commission 2. The Special Commission had agreed that the assumptions made in working paper 6 would receive particular attention at its next meetings in order to clarify the possible pre-conditions for establishing the economic viability of sea-bed mining, thus making it possible to agree on which working assumptions would be used for future studies. To further facilitate review by experts in the inter-sessional period, the Secretariat was requested at the final meeting of Special Commission 2 at the third session to present a summary of the views expressed on the question of assumptions, as reported in paragraphs 5 and 6 of the "Statement to the plenary by the Chairman of Special Commission 2 on the progress of work in that Commission", document LOS/PCN/L.20 of 2 April 1985.

2. In that statement, the Chairman went on to recall specific points made on the assumptions used in working paper 6, as well as on the sequencing of activities and the financial calculations of the paper. These points are summarized in paragraphs 15, 16 and 17 of document LOS/PCN/L.20.

3. In light of the points already enumerated in the statement of the Chairman, and considering the possible value of a further elaboration of working paper 6 for those conducting expert reviews prior to the next meetings of Special Commission 2,

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the Secretariat has assembled additional information on metal prices and made further calculations according to a number of selected variants to obtain the gross returns per unit of capital and the internal rates of return for the nine operational options examined in working paper 6.

4. These additional calculations will serve to further highlight the importance of certain of the key assumptions.

Assumptions regarding the economic viability of mining operations by the Enterprise

5. The main assumptions made in working paper 6 relate to the availability of enough raw materials to sustain a 20-year operation, markets for the four metals, on-land facilities and services and requisite skilled manpower and financial resources. The last two requirements are more relevant for Enterprise operations than for sea-bed mining in general.

6. The availability of markets, especially as regards prices for the outputs, likely interest rates for leasing purposes, economical processing and technological improvements were cited by various delegations at the third session as being crucial assumptions for establishing the economic viability of a project. The question was also raised as to whether use of the discounted cash flow method might lead to radically different results from those given in working paper 6.

Metal prices

7. The prices used in working paper 6, taken from the Hawaii study, were as follows:

Cobalt: $20.00 a pound or $44,000 a ton
Copper: $1.00 a pound or $2,200 a ton
Nickel: $3.50 a pound or $7,700 a ton
Ferromanganese: $500 a ton

8. The prices for cobalt, copper, nickel and ferromanganese, as published in "Metal Statistics 1984" 1/ were as follows:

(a) Cobalt (annual averages in dollars per 250 kg):

1978 ... 11.45	1980 ... 25.00	1982 ... 12.90
1979 ... 24.48	1981 ... 19.92	1983 ... 12.50

(b) Copper (annual averages in cents per pound of electrolytic copper wirebar):

1966 ... 36.00	1972 ... 51.44	1978 ... 66.53
1967 ... 38.10	1973 ... 59.53	1979 ... 92.75
1968 ... 41.17	1974 ... 77.06	1980 ... 102.19
1969 ... 47.43	1975 ... 64.53	1981 ... 85.59
1970 ... 58.07	1976 ... 69.62	1982 ... 74.56
1971 ... 52.09	1977 ... 66.72	1983 ... 78.33

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(c) Nickel (producer prices in cents per pound of electrolytic nickel cathodes):

3 November 1977	... 207-213
2 December 1977	... 206-208
3 April 1976	... 210
1 June 1978	... 208-210
6 July 1978	... 208
1 September 1978	... 200-205
16 November 1978	... 193-205
20 November 1978	... 193-200
2 February 1979	... 200-210
14 March 1979	... 230
6 April 1979	... 230-255
11 April 1979	... 255
3 May 1979	... 255-290
14 May 1979	... 285-290
5 June 1979	... 285-325
11 June 1979	... 300-325
18 June 1979	... 300-305
3 December 1979	... 320-325
4 December 1979	... 305-325
10 December 1979	... 325
28 February 1980	... 325-350
28 February 1980	... 350
25 November 1981	... 329-350
18 December 1981	... 329
1982*	... 329
1983*	... 329

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* There were no changes in producer-published prices in 1982 or 1983.

(d) Ferromanganese (annual averages in dollars per gross ton):

1973	... 200.00
1974	... 297.76
1975	... 440.00
1976	... 430.63
1977	... 404.00
1978	... 416.26
1979	... 479.04
1980	... 510.00
1981	... 510.00
1982	... 510.00
1983	... 510.00

9. Using the 1983 prices for estimating revenues, the results are 13 per cent less than in working paper 6:

	Revenues at 1983 prices	Revenues as in WP.6
Cobalt	158	252
Copper	61	78
Nickel	287	313
Ferromanganese	402	402
Total	908 (87% of 1,045)	1 045

Sensitivity of the working paper 6 model to variations

10. For analysing the sensitivity of the results in working paper 6 to changes in prices, inputs, capital costs, interest rates, etc., the following variations have been used:

(a) Gross revenues up or down by 25 per cent;

(b) Operating costs up or down by 25 per cent;

/...

(c) Output efficiency up or down by 10 per cent;

(d) Capital costs up or down by 25 per cent;

(e) Lease costs up or down by 25 per cent;

(f) Technologically determined factors whereby output efficiency is up 5 per cent with input also up 5 per cent or whereby output is down 10 per cent with input also down 5 per cent.

11. It may be noted that the 13 per cent variation in metal prices (as derived above) would be covered within the 25 per cent downward variation in gross revenues. This variant provides for a further fall in prices.

(a) Gross returns per unit of capital

12. The results in gross return per unit of capital, comparable to those given in paragraph 34 of working paper 6, are presented in table 1 below. They show that the earlier financial ranking of the nine options given in working paper 6 is not appreciably affected by the sensitivity test described in paragraph 10 above.

13. The results are most sensitive to the variations in gross revenue, operating costs, output efficiency, capital costs, technological and lease costs, in that order. There are some variations in this general ranking, as indicated by the asterisks. Most of them, however, are only a few percentage points off the general ranking.

14. The assumptions requiring maximum emphasis would therefore appear to relate to the market prices of metals, the prices of important inputs like chemicals and oil and the chances of improving output efficiency either by extracting more of the four metals or extracting more than four metals from the nodules.

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Table 1: GROSS RETURN PER UNIT OF CAPITAL

Operating mode: Mining by/ Processing by	Variant												
	(1) Gross revenues up 25%	(2) Operating costs down 25%	(3) Output efficiency up 10%	(4) Capital costs down 25%	(5) Output efficiency up 5%, input up 5%	(6) Lease costs down 25%	(7) BASE CASE WP.6	(8) Lease costs up 25%	(9) Output down 10% input 5%	(10) Capital costs up 25%	(11) Output efficiency down 10%	(12) Operating costs up 25%	(13) Gross revenues down 25%
Lease/Lease	32.5	27.8	25.0	20.6	21.1*	22.8*	20.0	17.4	16.3	19.4*	15.0	13.5	7.5
JV/Lease	20.4	16.2	15.6	13.9	13.1	13.8*	12.6	11.1	10.8	11.2*	9.2	8.3	4.4
Enterprise/ Lease	17.0	14.0	13.2	12.3	11.3	11.6*	10.7	9.8	8.7	9.4*	8.2	7.6	4.3
Lease/JV	12.7	10.4	10.0	9.9	8.7	8.6	8.2	7.8	7.2	7.0	6.4	6.3	3.8
Lease/ Enterprise	11.0	9.0	8.6	8.7*	7.4	7.3	7.0	6.7	5.8	5.8	5.5	5.5	3.1
Enterprise/ JV	8.7	7.1	6.9	7.2*	6.1	5.8	5.7	5.7	5.1	4.7	4.6	4.5	2.8
Enterprise/ Enterprise	8.6	7.1	6.8	7.1*	5.9	5.7	5.6	5.5	4.7	4.6	4.4	4.2	2.6
JV/JV	8.7	7.1	6.8	7.1*	5.9	5.7	5.6	5.5	5.3	4.6	4.4	4.2	2.6
JV/ Enterprise	8.5	6.9	6.6	6.9*	6.7*	5.5	5.4	5.3	4.8	4.4	4.2	3.9	2.3

* deviations in ranking

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(b) Internal rates of return

15. To test how the figures may be affected by application of the discounted cash flow technique, the internal rates of return for the nine options of working paper 6 have been worked out, both for the base case of working paper 6 and the 12 variations used in this addendum. The ranking is given in table 2 below, followed by the details of the calculations for each of the nine options.

/...

Table 2: INTERNAL RATE OF RETURN (IROR)

Operating mode: Mining by// Processing by	Variant												
	(1) Gross revenues up 25%	(2) Operating costs down 25%	(3) Output efficiency up 10%	(4) Capital costs down 25%	(5) Output efficiency up 5%, input up 5%	(6) Lease costs down 25%	(7) BASE CASE WP.6	(8) Lease costs up 25%	(9) Output down 10% input 5%	(10) Capital costs up 25%	(11) Output efficiency down 10%	(12) Operating costs up 25%	(13) Gross revenues down 25%
Lease/Lease	55.1	49.9	48.9	44.3	45.2*	46.2*	43.8	41.2	39.3	43.4*	37.8	36.4	25.3
JV/Lease	43.5	38.9	37.8	35.3	34.6	35.2*	33.4	31.4	30.9	31.7*	28.2	26.8	17.6
Enterprise/ Lease	38.8	34.6	33.9	32.3	31.2	31.4*	30.1	28.7	26.7	28.2*	25.7	24.9	17.2
Lease/JV	34.8	30.7	30.4	29.7	27.9	27.8	27.0	26.2	24.9	24.7	23.2	23.0	16.2
Lease/ Enterprise	32.7	28.8	28.3	28.1	25.8	25.5	24.9	24.2	22.0	22.3*	21.2	20.6	14.3
Enterprise/ JV	27.1	23.9	23.7	23.9*	21.8	21.2	21.1	20.9	19.5	18.8	18.2	17.9	13.0
Enterprise/ Enterprise	27.6	24.3	23.9	24.2*	21.9	21.4	21.1	20.9	18.8	18.7	18.1	17.6	12.5
JV/JV	27.8	24.5	24.0	24.3*	22.1	21.5	21.2	21.0	20.5	18.8	18.1	17.6	12.5
JV/ Enterprise	27.7	24.4	23.8	24.0*	21.7	21.2	20.9	20.6	19.2	18.4	17.6	16.9	11.7

* deviations in ranking

▨ IROR of less than 20%

▩ IROR of less than 15%

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BREAKDOWN OF TABLE 2

Mining and processing by lease
(figures for base case given in Table 4D of LOS/PCN/SCN.2/WP.6)

Variant	1987-96	1997	1998	1999	2000	2001	2002-20	2021	IROR
(1)	-90	-23	-14	-37	-52	-90	690	895	55.10%
(2)	-90	-23	-14	-37	-52	-78	541	709	49.90%
(3)	-90	-23	-14	-37	-52	-116	534	739	48.87%
(4)	-90	-23	-14	-32	-45	-134	429	634	44.25%
(5)	-90	-23	-14	-37	-52	-136	459	672	45.20%
(6)	-90	-23	-14	-37	-52	-113	471	662	46.23%
(7) base case	-90	-23	-14	-37	-52	-134	429	634	43.82%
(8)	-90	-23	-14	-37	-52	-155	387	606	41.20%
(9)	-90	-23	-14	-37	-52	-140	346	544	39.28%
(10)	-90	-23	-14	-42	-59	-134	429	634	43.37%
(11)	-90	-23	-14	-37	-52	-151	325	530	37.78%
(12)	-90	-23	-14	-37	-52	-190	317	560	36.40%
(13)	-90	-23	-14	-37	-52	-175	168	373	25.27%

Mining by joint venture and processing by lease
(figures for base case given in Table 8D of LOS/PCN/SCN.2/WP.6)

Variant	1987-96	1997	1998	1999	2000	2001	2002-20	2021	IROR
(1)	-102	-42	-48	-103	-102	-77	598	775	43.46%
(2)	-102	-42	-48	-103	-102	-64	474	717	38.90%
(3)	-102	-42	-48	-103	-102	-100	462	639	37.80%
(4)	-102	-36	-39	-81	-82	-115	372	549	35.25%
(5)	-102	-42	-48	-103	-102	-117	397	581	34.57%
(6)	-102	-42	-48	-103	-102	-99	404	560	35.20%
(7) base case	-102	-42	-48	-103	-102	-115	372	549	33.37%
(8)	-102	-48	-57	-125	-122	-131	340	538	31.45%
(9)	-102	-42	-48	-103	-102	-110	323	486	30.90%
(10)	-102	-42	-48	-103	-102	-115	372	549	31.67%
(11)	-102	-42	-48	-103	-102	-130	282	459	28.15%
(12)	-102	-42	-48	-103	-102	-166	270	481	26.79%
(13)	-102	-42	-48	-103	-102	-155	146	323	17.58%

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Mining by the Enterprise and Processing by Lease
(figures for base case given in Table 2D of LOS/PCN/SCN.2/WP.6)

Variant	1987-96	1997	1998	1999	2000	2001	2002-20	2021	IROR
(1)	-152	-67	-84	-175	-160	-69	732	923	38.79%
(2)	-152	-67	-84	-175	-160	-57	583	737	34.55%
(3)	-152	-67	-84	-175	-160	-95	576	767	33.91%
(4)	-152	-56	-66	-136	-126	-113	471	662	32.25%
(5)	-152	-67	-84	-175	-160	-113	501	700	31.15%
(6)	-152	-67	-84	-175	-160	-97	503	713	31.40%
(7) base case	-152	-67	-84	-175	-160	-113	471	662	30.06%
(8)	-152	-67	-84	-175	-160	-129	439	631	28.67%
(9)	-152	-67	-84	-175	-160	-119	388	572	26.69%
(10)	-152	-78	-102	-214	-194	-113	471	662	28.15%
(11)	-152	-67	-84	-175	-160	-130	367	558	25.66%
(12)	-152	-67	-84	-175	-160	-169	359	594	24.86%
(13)	-152	-67	-84	-175	-160	-156	210	401	17.16%

Mining by lease and processing by joint venture
(figures for base case given in Table 7D of LOS/PCN/SCN.2/WP.6)

Variant	1987-96	1997	1998	1999	2000	2001	2002-20	2021	IROR
(1)	-107	-34	-72	-217	-243	-25	528	642	34.83%
(2)	-107	-34	-72	-217	-243	-19	425	515	30.74%
(3)	-107	-34	-72	-217	-243	-42	424	538	30.39%
(4)	-107	-31	-57	-167	-189	-54	354	468	29.72%
(5)	-107	-34	-72	-217	-243	-56	374	493	27.93%
(6)	-107	-34	-72	-217	-243	-47	368	477	27.76%
(7) base case	-107	-34	-72	-217	-243	-54	354	468	26.99%
(8)	-107	-34	-72	-217	-243	-61	340	459	26.20%
(9)	-107	-34	-72	-217	-243	-53	312	417	24.85%
(10)	-107	-37	-87	-267	-297	-54	354	468	24.66%
(11)	-107	-34	-72	-217	-243	-66	285	399	23.20%
(12)	-107	-34	-72	-217	-243	-88	287	424	23.03%
(13)	-107	-34	-72	-217	-243	-83	180	294	16.22%

/...

Mining by lease and processing by Enterprise

(figures for base case given in Table 3D of LOS/PCN/SCN.2/WP.6)

Variant	1987-96	1997	1998	1999	2000	2001	2002-20	2021	IROR
(1)	-151	-48	-129	-397	-437	-43	784	958	32.66%
(2)	-151	-48	-129	-397	-437	-31	635	772	28.77%
(3)	-151	-48	-129	-397	-437	-69	628	802	28.25%
(4)	-151	-42	-100	-302	-334	-87	523	697	28.05%
(5)	-151	-48	-129	-397	-437	-88	553	734	25.84%
(6)	-151	-48	-129	-397	-437	-78	541	709	25.54%
(7) base case	-151	-48	-129	-397	-437	-87	523	697	24.90%
(8)	-151	-48	-129	-397	-437	-96	505	685	24.23%
(9)	-151	-48	-129	-397	-437	-93	440	607	22.02%
(10)	-151	-54	-158	-492	-540	-87	523	697	22.30%
(11)	-151	-48	-129	-397	-437	-104	419	593	21.16%
(12)	-151	-48	-129	-397	-437	-143	411	623	20.55%
(13)	-151	-48	-129	-397	-437	-130	262	436	14.30%

Mining by Enterprise and processing by joint venture

(figures for base case given in Table 5D of LOS/PCN/SCN.2/WP.6)

Variant	1987-96	1997	1998	1999	2000	2001	2002-20	2021	IROR
(1)	-169	-78	-142	-355	-351	-5	569	669	27.11%
(2)	-169	-78	-142	-355	-351	1	466	542	23.87%
(3)	-169	-78	-142	-355	-351	-22	465	565	23.65%
(4)	-169	-64	-109	-217	-270	-34	395	495	23.85%
(5)	-169	-78	-142	-355	-351	-35	416	521	21.82%
(6)	-169	-78	-142	-355	-351	-32	399	498	21.22%
(7) base case	-169	-78	-142	-355	-351	-34	395	495	21.05%
(8)	-169	-78	-142	-355	-351	-36	391	492	20.88%
(9)	-169	-78	-142	-355	-351	-32	354	445	19.47%
(10)	-169	-92	-175	-439	-432	-34	395	495	18.76%
(11)	-169	-78	-142	-355	-351	-46	326	426	18.20%
(12)	-169	-78	-142	-355	-351	-69	324	447	17.93%
(13)	-169	-78	-142	-355	-351	-63	221	321	13.04%

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Mining and Processing by the Enterprise
(figures for base case given in Table 1D of LOS/PCN/SCN.2/WP.6)

Variant	1987-96	1997	1998	1999	2000	2001	2002-20	2021	IROR
(1)	-213	-92	-199	-535	-545	-22	826	986	27.63%
(2)	-213	-92	-199	-535	-545	-10	677	800	24.32%
(3)	-213	-92	-199	-535	-545	-48	670	830	23.93%
(4)	-213	-75	-152	-405	-415	-66	565	725	24.21%
(5)	-213	-92	-199	-535	-545	-68	595	762	21.92%
(6)	-213	-92	-199	-535	-545	-62	573	731	21.37%
(7) base case	-213	-92	-199	-535	-545	-66	565	725	21.14%
(8)	-213	-92	-199	-535	-545	-70	557	719	20.90%
(9)	-213	-92	-199	-535	-545	-72	482	635	18.75%
(10)	-213	-109	-246	-664	-675	-66	565	725	18.68%
(11)	-213	-92	-199	-535	-545	-83	461	621	18.06%
(12)	-213	-92	-199	-535	-545	-122	453	657	17.60%
(13)	-213	-92	-199	-535	-545	-109	304	464	12.52%

Mining and processing by joint venture
(figures for base case given in Table 9D of LOS/PCN/SCN.2/WP.6)

Variant	1987-96	1997	1998	1999	2000	2001	2002-20	2021	IROR
(1)	-107	-48	-104	-281	-291	-12	435	520	27.81%
(2)	-107	-48	-104	-281	-291	-5	357	427	24.51%
(3)	-107	-48	-104	-281	-291	-26	352	437	24.04%
(4)	-107	-39	-80	-214	-224	-35	297	382	24.28%
(5)	-107	-48	-104	-281	-291	-36	313	402	22.05%
(6)	-107	-48	-104	-281	-291	-33	301	385	21.47%
(7) base case	-107	-48	-104	-281	-291	-35	297	382	21.25%
(8)	-107	-48	-104	-281	-291	-37	293	379	21.01%
(9)	-107	-48	-104	-281	-291	-33	283	363	20.53%
(10)	-107	-57	-128	-348	-358	-35	297	382	18.79%
(11)	-107	-48	-104	-281	-291	-44	242	327	18.12%
(12)	-107	-48	-104	-281	-291	-65	237	337	17.61%
(13)	-107	-48	-104	-281	-291	-58	159	244	12.51%

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Mining by joint venture and processing by Enterprise
(figures for base case given in Table 6D of LOS/PCN/SCN.2/WP.6)

Variant	1987-96	1997	1998	1999	2000	2001	2002-20	2021	IROR
(1)	-164	-67	-163	-463	-487	-30	692	837	27.69%
(2)	-164	-67	-163	-463	-487	-17	568	679	24.38%
(3)	-164	-67	-163	-463	-487	-53	556	701	23.77%
(4)	-164	-55	-125	-351	-371	-68	466	611	24.01%
(5)	-164	-67	-163	-463	-487	-70	491	643	21.66%
(6)	-164	-67	-163	-463	-487	-64	474	616	21.16%
(7) base case	-164	-67	-163	-463	-487	-68	466	611	20.87%
(8)	-164	-67	-163	-463	-487	-72	458	606	20.57%
(9)	-164	-67	-163	-463	-487	-62	417	549	19.23%
(10)	-164	-79	-201	-575	-603	-68	466	611	18.36%
(11)	-164	-67	-163	-463	-487	-83	376	521	17.60%
(12)	-164	-67	-163	-463	-487	-119	364	544	16.92%
(13)	-164	-67	-163	-463	-487	-106	240	385	11.69%

16. The above results do not vary significantly from the results of table 1 in gross return per unit of capital, or with the financial ranking given earlier in paragraph 34 of working paper 6. The figures that vary are marked with an asterisk. The hatched areas in table 2 show the cases where the internal rate of return would be less than 20 per cent; the cross-hatched area shows where the internal rate of return would fall below 15 per cent. The most significant variant in both instances is the 25 per cent fall in revenues, although it may be noted that in only five of the nine options does such a fall in revenues bring the internal rate of return below 15 per cent. For four of the nine options, the variants covering rises in operating and capital costs and decreases in output efficiency and input are also of significance. In only three of the options would increases in leasing costs bring the internal rate of return below 20 per cent.

17. In the light of these results, it may be worth considering dividing into two any further financial study of these operational options. A first group would be the first five options in the ranking; the second, the following four. This would also have the effect of separating out those options which involve leasing of mining and/or processing from those that do not.

Notes

1/ Metal Statistics 1984, 77th annual edition (New York, Fairchild Publishers, 1984).

LOS/PCN/SCN.2/WP.6/Add.1/Corr.1
19 August 1985

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEA-BED AUTHORITY
AND FOR THE INTERNATIONAL TRIBUNAL
FOR THE LAW OF THE SEA
Special Commission 2

PROJECT PROFILE OF A DEEP-SEA-BED MINING OPERATION BY THE ENTERPRISE

Working paper by the Secretariat

(Corrigendum)

1. Page 2, paragraph 8 (a), first line

   For per 250 kg read per pound

2. Page 12, paragraph 16, last line

   For increases in leasing costs read adverse changes in technology

LOS/PCN/SCN.2/WP.7
1 February 1985

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2

DEVELOPMENT OF AN AD HOC EXPERT CORE GROUP FOR THE ENTERPRISE TO ASSIST THE PREPARATORY COMMISSION

Working paper prepared by the Secretariat

1. Soon after the Enterprise is made administratively and structurally operational its management will have to address itself to the task of framing policies relevant to the acquisition of technology, corporate planning and to possible operating strategies (including the formation of joint ventures, lease arrangements etc.). The management will also have to estimate, along with the concomitant phasing, the likely costs of one integrated mining operation and to submit to the Authority formal written work plans and programmes in this regard.

2. The above tasks would require the management's taking a broad and futuristic look at the deep sea-bed mining industry and the possible role that the Enterprise could play in this regard. To perform this role effectively and efficiently, top management of the Enterprise would have to have access to: technological assessments and forecasts, forecasts of metal prices likely to prevail during the period of exploitation, detailed project reports and techno-economic feasibility studies, the marketability of products in the world markets, and so on. While the above information can to some extent be acquired through the use of outside consultants, an in-house expert team is necessary for coherently planning and performing tasks which are by their very nature intricate and sensitive.

3. It is intended to examine in this paper what the size, composition and phasing of this ad hoc expert core group should be and how its recruitment and induction can be facilitated. The assumption made in the paper entitled "A project profile of a deep sea-bed mining operation by the Enterprise" (LOS/PCN/SCN.2/WP.6), namely, that the Convention comes into force in 1990, will be used in this paper also. It will also further be assumed that an ad hoc core group of four experts will be inducted in 1987 to advise the Preparatory Commission in regard to decisions relating to selection of a reserved site for the Enterprise, on the modalities of exploration therein, training requirements of the Enterprise, etc.

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4. While the ad hoc expert core group would primarily assist the Preparatory Commission in the discharge of its responsibilities under paragraph 12 of resolution II of the Convention, some of the work that it would necessarily have to do would also constitute an input into the decision-making processes of the Enterprise's management. For example, while assisting the Preparatory Commission in the discharge of its functions specified in paragraph 12 (a) of resolution II relating to exploration, training and transfer of technology the core group would have to monitor development in the deep sea-bed mining industry, explore alternative technology acquisition and operating strategies, prepare techno-economic feasibility studies, identify broad staff requirements and suggest some possible project implementation strategies. In addition, the core group would have to draft operating manuals and administrative procedures, survey the financial markets to establish the position regarding financing of the Enterprise's operations, make rough forecasts of future markets and prices of metals in connection with techno-economic feasibility studies and roughly evaluate the reserved areas. Some of the work likely to be done by the core group and relevant to the decision-making processes of the Enterprise may be seen in figure I.

5. Figure I also delineates some of the main technical and other inputs into the decision-making process, as well as some of the major decisions which would have to be taken by the management of the Enterprise (Council, Governing Board, Director-General), if the project is to proceed in the sequence of activities outlined in document LOS/PCN/SCN.2/WP.6. The main decisions to be taken by the Preparatory Commission would relate to exploration activities (if considered necessary on the selected reserve site) in the period 1988-1991 and to the identification and possible recruitment and training of staff (decision to be taken in 1989 when the sixtieth ratification or accession is expected to have been made). Thereafter the management of the Enterprise would have to decide on its technology acquisition and operating strategies, on the adoption of the administrative and financial procedures applicable to the Enterprise and on the strategy to be followed in recuiting and developing its staff. The above decisions would have to be taken by the middle of 1990 mainly on the basis of the work done by the ad hoc expert core group and any staff recruited in 1989.

6. Thereafter the work proceeds as in document LOS/PCN/SCN.2/WP.6 (see figure II) with the management having to take investment decisions in 1992 and 1996 involving going ahead with pilot tests and commercial operations respectively. In both cases, therefore, detailed techno-economic feasibility studies would be required.

7. The requirements of manpower for the operating options may be seen in figure III. It is clear from figure III that the requirements of design and managerial manpower (the critical requirement during the earlier stages when the main emphasis would be on design and system selection and configuration) do not vary much from 1994 to 1999. In 2000 there is an increase to meet the requirements of operating personnel whose training and composition would, however, be very much related to the technology selected for the Enterprise. It is proposed in this paper, therefore, to confine discussion to the requirements of experts until 1995 since nothing would be known about the technology selected for the Enterprise until 1990.

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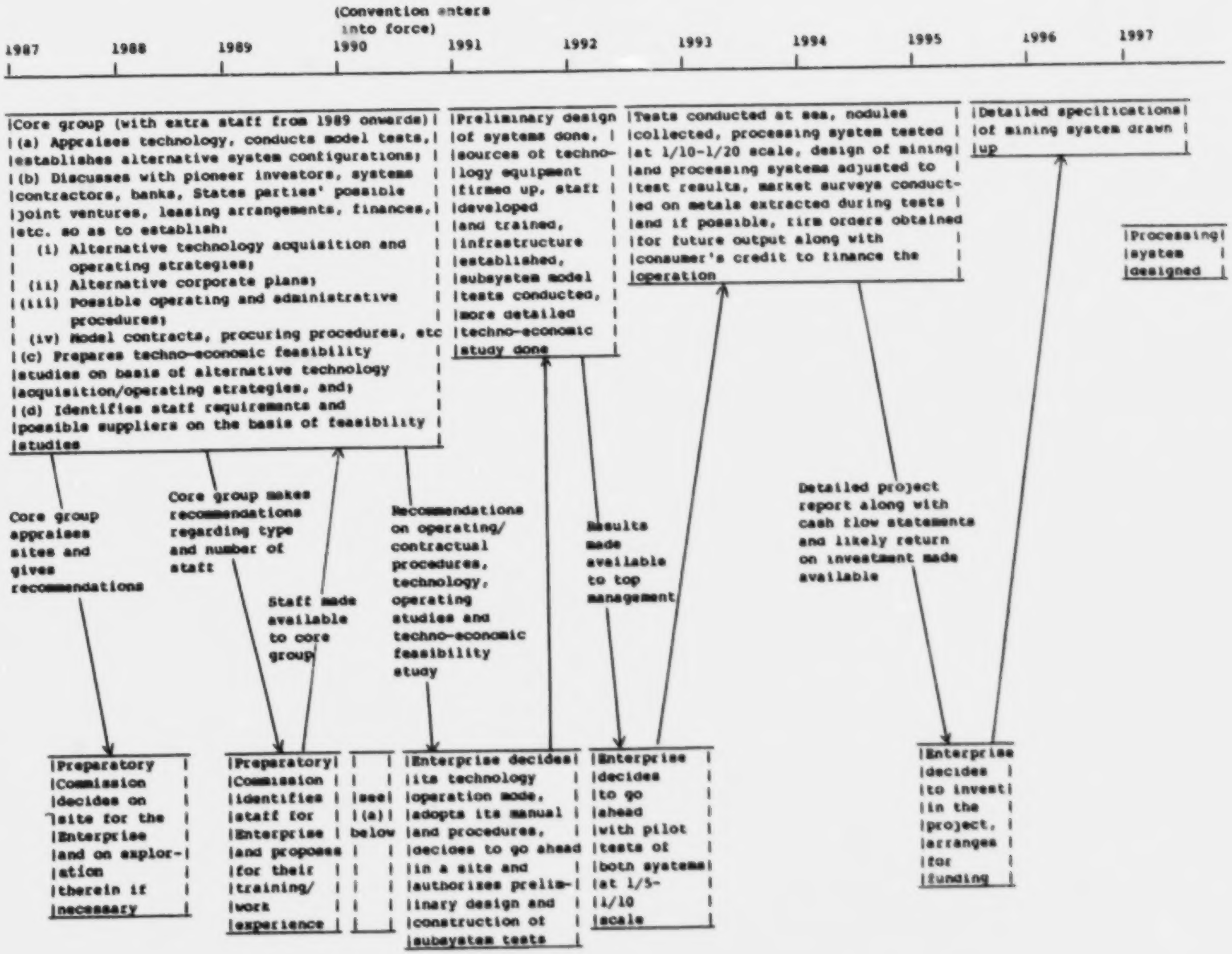
Figure I



Core group (with extra staff from 1989 onwards)
(a) Appraises technology, conducts model tests, establishes alternative system configurations;
(b) Discusses with pioneer investors, systems contractors, banks, States parties' possible joint ventures, leasing arrangements, finances, etc. so as to establish:
(i) Alternative technology acquisition and operating strategies;
(ii) Alternative corporate plans;
(iii) Possible operating and administrative procedures;
(iv) Model contracts, procuring procedures, etc
(c) Prepares techno-economic feasibility studies on basis of alternative technology acquisition/operating strategies, and;
(d) Identifies staff requirements and possible suppliers on the basis of feasibility studies

Preliminary design of systems done, sources of technology equipment firmed up, staff developed and trained, infrastructure established, subsystem model tests conducted, more detailed techno-economic study done

Tests conducted at sea, nodules collected, processing system tested at 1/10-1/20 scale, design of mining and processing systems adjusted to test results, market surveys conducted on metals extracted during tests and if possible, firm orders obtained for future output along with consumer's credit to finance the operation

Detailed specifications of mining system drawn up

Processing system designed

Core group appraises sites and gives recommendations

Core group makes recommendations regarding type and number of staff

Staff made available to core group

Recommendations on operating/contractual procedures, technology, operating studies and techno-economic feasibility study

Results made available to top management

Detailed project report along with cash flow statements and likely return on investment made available

Preparatory Commission decides on site for the Enterprise and on exploration therein if necessary

Preparatory Commission identifies staff for Enterprise and proposes for their training/work experience

see (a) below

Enterprise decides its technology operation mode, adopts its manual and procedures, decides to go ahead in a site and authorises preliminary design and construction of subsystem tests

Enterprise decides to go ahead with pilot tests of both systems at 1/5-1/10 scale

Enterprise decides to invest in the project, arranges for funding

(a) Authority sets up Enterprise, elects Board of Governors, establishes policy

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Figure II

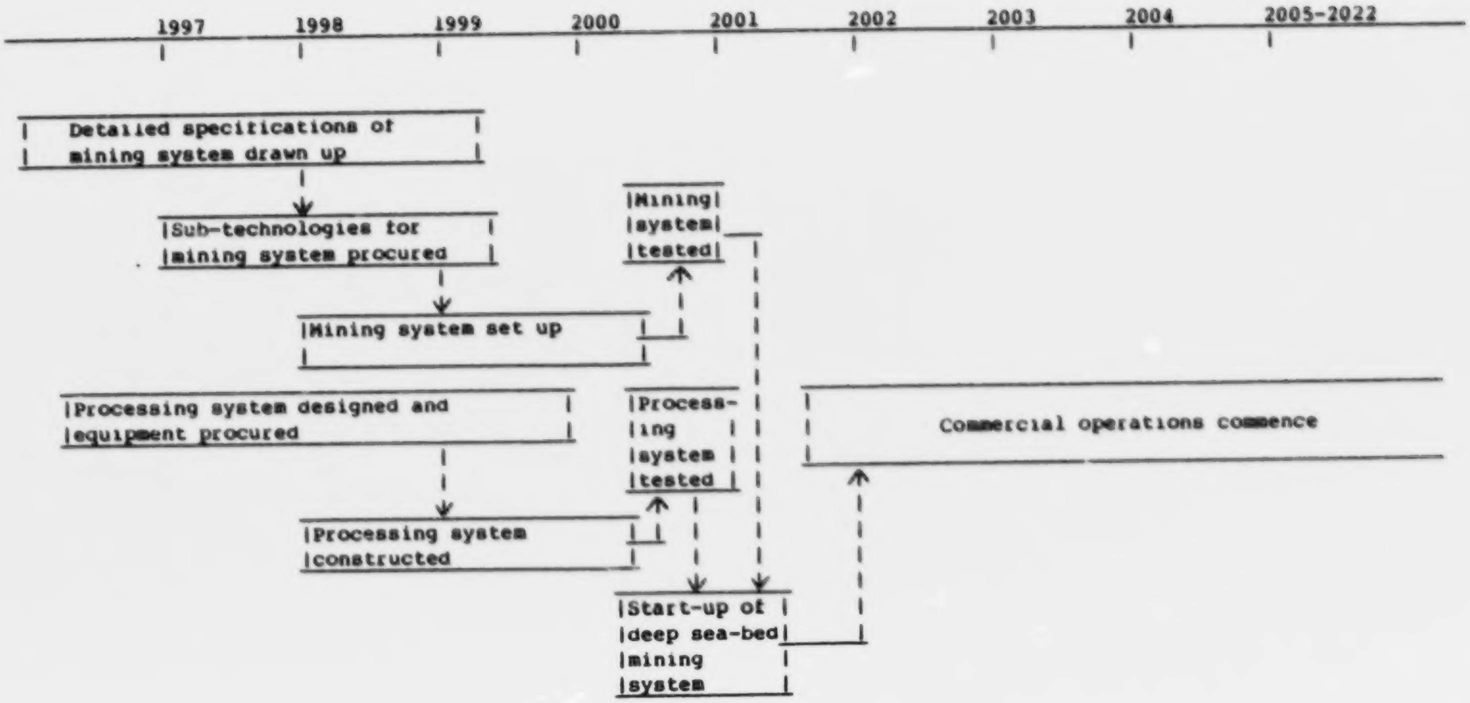
1997
1998
1999
2000
2001
2002
2003
2004
2005-2022
Detailed specifications of mining system drawn up
Sub-technologies for mining system procured
Mining system set up
Mining system tested
Processing system designed and equipment procured
Processing system constructed
Process-ing system tested
Start-up of deep sea-bed mining system
Commercial operations commence

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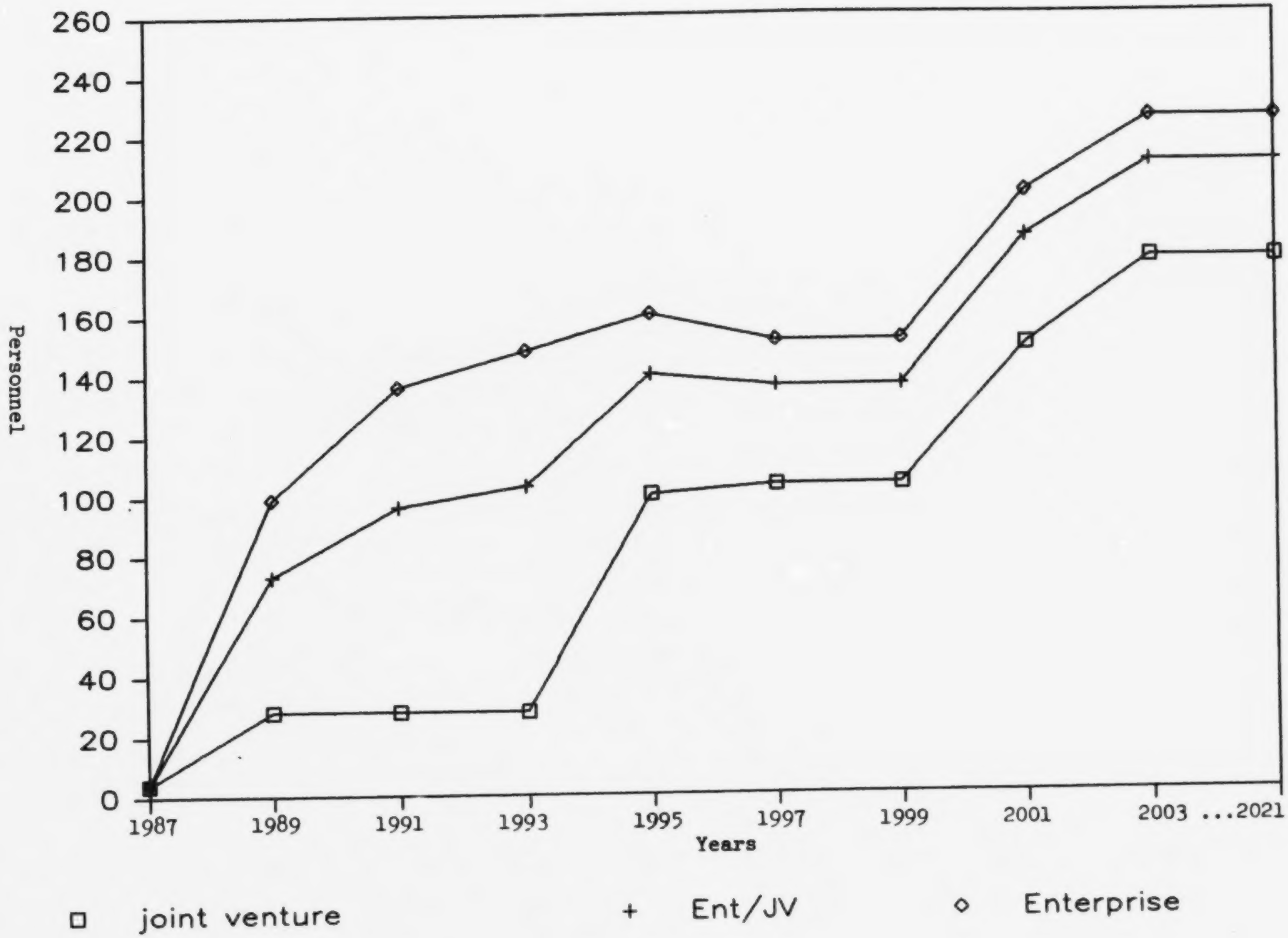
Figure III. Managerial and design personnel flow



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8. The flow of manpower (based on the figures in document LOS/PCN/SCN.2/WP.6) for the different operating options may be seen in table 1. The requirements for design and managerial manpower vary from 28 (for the joint venture) to 148 (for the wholly Enterprise-operated option) with a mid-range of 103 (for the partial joint venture) for the year 1993. The figures go up to 100, 160 and 140, respectively, in 1994 and hover around that figure till 1999. The minimum staff to be recruited in 1989, pending the choice of operating option by the management of the Enterprise, would, therefore, be 28 so that it could smoothly fit into whatever operating option is ultimately selected by the management of the Enterprise. The initial staff may be approximately 30, consisting of 4 senior managers, 17 engineers and scientists, 1 lawyer and 8 supporting staff.

9. During the rest of the paper it is proposed to examine the implication of the wholly Enterprise-operated option as well as of the partial joint venture in mining since mining is where the main technological problem lies. Since the other types of joint ventures are much less demanding in terms of staff requirements and technology transfer strategies, they would be adequately covered in the discussions on the other two options. The requirement of personnel for the two options is presented in table 2. It needs to be noted that for most staff there is an in-built staff redundancy of almost 100 per cent to cater for losses due to attrition, etc.

10 In the very beginning of its operation the Enterprise would thus require about 10 managerial staff, 10 or 27 key mining design staff, 27 key processing design staff and 11 key scientists. After correcting for redundancy the figures come to 5 to 6 management staff, 5 to 13 key mining staff, 13 key processing staff and 5 scientists. The tasks required from them would, *inter alia*, relate to: technology forecasting, technology assessments, preparation of environmental impact statements, system configuration, exploring of financing possibilities, drawing up of technology transfer agreements, development of requisite manpower skills, making of financial and economic analyses, identification of sources of technology/ hardware, establishment of appropriate infrastructure, conducting of tests at sea, designing systems and preparing techno-economic feasibility studies. Besides, the *ad hoc* expert core group, through its top management, would have to interface with the Governing Board of the Enterprise and the Council of the Authority.

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Table 1

Operating option	Type of personnel	1987	1988	1989	1990	1991	1992	1993	1994	1995
Both processing and mining owned/leased by the Enterprise	Managerial	4	4	8	10	10	12	12	14	14
	Mining design	-	-	36	50	50	55	55	60	60
	Processing design	-	-	36	50	50	55	55	60	60
	Scientists	-	-	19	26	26	26	26	26	26
	Support/operating	4	4	15	19	19	24	24	48	48
Processing owned/ leased by the Enterprise and mining by joint venture	Managerial	4	4	8	10	10	12	12	14	14
	Mining design	-	-	10	10	10	10	10	40	40
	Processing design	-	-	36	50	50	55	55	60	60
	Scientists	-	-	19	26	26	26	26	26	26
	Support/operating	4	4	10	15	15	19	19	48	48
Mining owned/ leased by the Enterprise and processing by joint venture	Managerial	4	4	8	10	10	12	12	14	14
	Mining design	-	-	36	50	50	55	55	60	60
	Processing design	-	-	10	10	10	10	10	40	40
	Scientists	-	-	19	26	26	26	26	26	26
	Support/operating	4	4	10	15	15	16	16	45	45
Both mining and processing by joint venture	Managerial	4	4	4	4	4	4	4	11	11
	Mining design	-	-	10	10	10	10	10	40	40
	Processing design	-	-	10	10	10	10	10	40	40
	Scientists	-	-	4	4	4	4	4	9	9
	Support/operating	4	4	8	8	8	8	8	35	35

Note: In the case of service contracts and production sharing arrangements, the manpower requirements for designing and planning would be somewhat lower than the first case. There would be a sharp fall, however, in the case of operating personnel.

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Table 2

Operating option	Type of personnel	1987	1988	1989	1990	1991	199[illegible]	1993	1994	1995
Both processing and mining owned/leased by the Enterprise	1. Senior administrative/financial	4	4	4	5	5	6	6	6	6
	2. Procurement	-	-	3	3	3	4	4	6	6
	3. Legal	-	-	1	2	2	2	2	2	2
	4. Mining									
	4.1 Key staff	-	-	24	27	27	27	27	27	27
	4.2 Trainee/support	-	-	12	23	23	28	28	33	33
	5. Processing									
	5.1 Key staff	-	-	24	27	27	27	27	27	27
	5.2 Trainee/support	-	-	12	23	23	28	28	33	33
	6. Scientists									
	6.1 Key staff	-	-	11	11	11	11	11	11	11
	6.2 Trainee/support	-	-	8	15	15	15	15	15	15
Mining through joint venture while processing is owned/leased by the Enterprise	1. Senior administrative/financial	4	4	4	5	5	6	6	6	6
	2. Procurement	-	-	3	3	3	4	4	6	6
	3. Legal	-	-	1	2	2	2	2	2	2
	4. Mining									
	4.1 Key staff	-	-	10	10	10	10	10	20	20
	4.2 Trainee/support	-	-	-	-	-	-	-	20	20
	5. Processing									
	5.1 Key staff	-	-	24	27	27	27	27	27	27
	5.2 Trainee/support	-	-	12	23	23	28	28	33	33
	6. Scientists									
	6.1 Key staff	-	-	11	11	11	11	11	11	11
	6.2 Trainee/support	-	-	8	15	15	15	15	15	15

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11. For the performance of these tasks, the following activities and outputs would be required:

Activity	Output
1. Design	
1.1. Conceptual design	General configurations and arrangements, functions
1.2. Preliminary design	Preliminary drawings, requirements and specifications
1.3. Detailed design	Final drawings, requirements, specifications
2. Research and development	
2.1. Component tests	Phenomena identification, performance assessment, analysis validation/update
2.2. Subsystem tests	Performance verification and assessment, analysis validation/update
2.3. Engineering analysis	Methods, parametric studies, rationale for requirements.
3. Financial/Economic/Operational Analysis	Finance requirements, rate of investment estimates, configuratión decision basis
4. System integration	Assemble components in complete subsystems/systems

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Source: Alternatives for Technology Transfer to the Enterprise: Science Applications, Inc., P.O. Box 2351, La Jolla, CA 92038, USA.

12. The management team thus has to have strong capabilities in management of deep sea-bed mining and/or other large and complex technologies. They should also be capable of presenting the risks and alternatives to the Governing Board and the Director-General as well as of laying down procedures that ensure conformity by contractors to rigid time schedules and equipment capable of reliable performance. The managerial team should have the following as key elements:

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	Category	Functional Area	Likely recruitment area
1.	General Manager	General management	Experience in management of deep sea-bed mining, offshore oil, aerospace, complex military systems
2.	Engineering Manager	Marine systems design and development	Deep sea-bed mining, offshore oil or gas, space agency or company
3.	Financial Manager	Economic and financial feasibility/ viability	Deep sea-bed mining, offshore oil, aerospace or other complex/risky system
4.	Manpower Development Manager	Training and development of staff, upgrading of skills	Management institute, large multinational concern, training consultant

13. For effective transfer of technology and for building up capabilities for independent design of complex systems in the future a proper mix of engineering designers, systems analysts and scientists is necessary. A redundant capability (including trainees and understudies) has to be catered for because of likely future turnover of staff. The following would form the critical element on the engineering and scientific side for transfer of technology on the mining side:

	Category	Functional area	Likely recruitment area
1.	Senior design engineers	Marine systems	Chief Engineer or equivalent on large and varied offshore projects
2.	Naval architects	Design of mining ship/transport vessel	Senior naval architect with experience in innovative ship systems designing
3.	Electrical/ electronic system engineers	Electronics/ electrical system design	Design and development of underwater systems utilizing prime movers, connectors instrumentation and data acquisition
4.	Material handling engineers	Solids handling Sperry hydraulics	Design of materials handling systems for dewatering of ore particles/mining, material handling
5.	Systems engineers	Mechanical systems engineer/operational analysis	Manager of systems engineering functions on offshore projects/offshore industry/aerospace

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6.	Marine structures engineers	Dynamic structures	Manage and perform marine structure dynamic and structural analysis on systems of similar complexity/marine structures
7.	Applied mathematicians	Applied mathematics, statistics, operations analysis	Statistical analysis of data regarding ore tenor. General statistical capability in mining industry/aerospace/oceanography
8.	Marine geologist	Marine geology	Development of offshore plans for offshore deposit delineation/characterization/offshore industry, oil, dredging

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Source: Alternatives for Technology Transfer to the Enterprise: Science Applications, Inc., La Jolla, CA 92038, USA.

14. For processing and environmental evaluation the following would be also necessary:

	Category	Functional area	Likely recruitment area
1.	Chemical oceanographer	Chemical oceanography	Study of pollution in the oceans/offshore oilfields/shipping industry
2.	Processing/ Chemical engineers	Chemical processing	Chief Engineer or equivalent in a large metal smelting plant/mining company/metallurgical institute
3.	Instrumentation engineers	Instrumentation	Design and development of control equipment for processing plants
4.	Quality control engineers	Quality control	Design and development of quality control systems
5.	Waste management engineers	Waste management	Planning and execution of all phases of waste disposal in chemical/processing plants
6.	Manager surveys	Ocean surveys	Planning of sea cruises and surveys, preparation of operational mining plan, evaluation of abundance etc. of ore

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7.	Contracts managers	Subcontract negotiations, vendor negotiation, performance monitoring	Contract negotiation in aerospace mining, military systems
8.	Procurement engineers	Purchasing and subcontracting, quality control	Procurement experience in mining, aerospace, military etc.

Recruitment procedures

15. The establishment process would take about 15 months while it would take another 9 months for the staff to be trained and to reach peak efficiency, as follows:

Talent search	6 months
Recruitment process	6 months
Getting person in position	3 months
Breaking in/training	6 months
Reaching peak efficiency	3 months

16. Search for the 30 persons to be recruited in 1989 (4 management, 17 scientists/engineers, 1 lawyer and 8 supporting staff) should therefore start in 1988 on the basis of skills and disciplines identified by the ad hoc expert core group so that they can be recruited by 1989 and reach peak efficiency by 1990. This talent search would also help in identifying the trainees and other staff (totalling from 43 to 69 for the two options being considered) so that they could be recruited by the Enterprise in 1990. The Enterprise could itself start the talent hunt for the rest of the staff (from 23 to 37) so that they could be recruited in 1991. The increases after 1991 are somewhat marginal and could be recruited by the Enterprise in the period 1992-1995.

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LOS/PCN/SCN.2/WP.8
1 February 1985

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2

TRAINING NEEDS AND REQUIREMENTS OF THE ENTERPRISE

Working paper prepared by the Secretariat

1. The training strategy for the Enterprise would have to flow from the same assumptions that govern document LOS/PCN/SCN.2/WP.6, entitled "A project profile of a deep sea-bed mining operation by the Enterprise", namely, the likely induction of the *ad hoc* expert core group in 1987, the coming into force of the Convention in 1990, recruitment of the first component of the Enterprise's staff in 1989 and appropriate decisions to go ahead with pilot tests and the acquisition (including leasing) of the plant and equipment required for commercial operations being taken in the middle of 1992 and 1995 respectively. The flow of staff would also have to be in consonance with the sequence of project activities delineated in charts I and II of document LOS/PCN/SCN.2/WP.6.

2. The staff of the Enterprise would be required to have capabilities relating to both the technical and economic inputs delineated in document LOS/PCN/SCN.2/WP.7 entitled "Development of an *ad hoc* expert core group for the Enterprise to assist the Preparatory Commission", and to the skills required for assisting the top management of the Enterprise (the Governing Board and the Director-General) in the taking of the decisions mentioned therein (see figure I of document LOS/PCN/SCN.2/WP.7). These inputs, relating as they do to technological assessments and forecasts, future metal prices, marketability of metals, detailed project reports and techno-economic feasibility studies, would require the staff of the Enterprise to perform, *inter alia*, the following functions:

/...

1990-1992	Technological forecasting; technology assessment; economic and financial evaluation of complex and futuristic technologies unde conditions of uncertainty; preliminary design of feasible and economic mining and processing sub-systems; establishment of infrastructural support networks; identification of suppliers of equipment; sub-system model tests; negotiations for technology acquisition; joint ventures etc.
1993-1995	Conducting and evaluating at-sea tests; market surveys; updating designs; detailed project reports; firming of contracts with suppliers; arranging for funding (consumers credit, suppliers credit, bank loans, leasing, equity); environmental impact statements.
1996-2001	Finalization of designs and specifications; procurement of plant and equipment; construction of processing plant and on-land facilities; testing and start-up.
2002-2022	Operation and maintenance of mining and processing systems; pre-mining exploration, research and development for possible updating of systems; marketing of products.

3. To perform the above functions, and depending on the choice of the operational option, there is need for certain skills and capabilities relating to planning, evaluation, design, acquisition and assessment of complex technology. These skills would be most in evidence during the period 1990-1995 and till such time as the final go-ahead decision is taken regarding the procurement of plant and equipment required for exploitation activities in the Area. Thereafter (in the period 1996-2001) the stress would shift to procurement activities including drawing up o proper contracts for ensuring adherence to quality and rigid time schedules. The nucleus of operating staff would also have to be in position by 1999-2000 for starting up the system so that the nucleus could thereafter be expanded into the full operating team likely to be required for the period 2002-2021. The establishment, hiring, etc. of the construction force during the period 1996-2000 would normally be provided by the contractor allocated the task of constructing the processing plant.

4. The required skills mentioned above would be in the areas of science, technology, economics, finance and management. The optimal situation would be if all the requisite personnel to be recruited by the Enterprise had some prior experience in the field of deep sea-bed mining. In view of the grave shortage of such personnel, however, it is more likely that the personnel would come from related fields like the offshore industry, the shipping field, dockyards, aerospace agencies or firms, oceanography etc. In the latter case the staff would have already been trained, and had experience in fields like marine geology, electronics, systems engineering, naval architecture, offshore structures, materials, instrumentation, management, law, finance, economics, oceanography, processing industries, quality control, waste management systems, procurement procedures, marine design, etc. Many of them would also have had some experience of marine conditions. To enable the staff to function at peak efficiency it would be necessary to quickly attune them to the unique problems of deep sea-bed mining as well as to develop them into a close-knit, integrated and harmonious team.

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5. To familiarize them with the peculiarities of deep sea-bed mining technologies, appropriate arrangements may be made with the pioneer investors and/or other producers of marine technology. Opportunities should also be provided to the personnel of the Enterprise to interact effectively with the design/system configuration organizations of pioneer investors, producers of marine technology and systems contractors. Further, the managerial component should be given the opportunity to interact with appropriate personnel in the organizations of pioneer investors etc. so as to be able to appreciate the nuances involved in assessing and acquiring complex and developing technology as well as in developing techno-economic feasibility reports in this regard. While the actual and detailed programmes of training would be dependent on the actual skills of the personnel recruited, and the areas identified by the ad hoc core group in which further acquisition of skills is considered necessary, the broad parameters of such a programme would relate to the provision of opportunities whereby the staff of the Enterprise can familiarize themselves with the methodologies and tools required in the: (a) preparation of techno-economic feasibility reports; (b) design of mining and processing systems; (c) systems configuration techniques; (d) establishment of appropriate infrastructural networks; (e) negotiations for technology acquisition; (f) evaluation of at-sea tests; (g) market surveys; (h) forecasting of futures in metal prices; (i) ensuring of adherence to quality and time schedules etc.

6. The above skills, duly updated and sharpened through on-the-job training, could thereafter be transferred by the trained staff to others so that a reservoir of skilled design and managerial personnel would be always available to the Enterprise in case at a future date it decides to expand its activities. As regards the operating staff to be inducted from 2000 onwards, the suppliers of the mining and processing equipment could be used to train the staff of the Enterprise so that they could manage, maintain and operate the plant. The training services to be provided by the technology suppliers could include, if necessary, the devising of a long-term training plan, setting up of an in-plant training programme, administering a training centre for the benefit of the engineers, technicians and other technical staff of the Enterprise, making arrangements for training higher level staff, such as administrative, financial, marketing, managerial, and providing adequate numbers of engineers, specialists and experts to help run the plant/equipment till such time as the Enterprise is in a position to take over. All these conditions, which are fairly normal, could be included in the contracts with the technology suppliers.

7. Since the decision on the likely technology to be acquired would only be taken sometime during the period 1990-1996, it would not be possible at this stage to go into details of recruitment and training procedures necessary for the operating staff. As regards the scientific, design and managerial staff required in the period 1990-1995, an indication of the types and numbers required for different operating options has been given in document LOS/PCN/SCN.2/WP.7. The requirements for the option where the entire work is to be done by the Enterprise (whether by purchase or lease) are shown in table 1 below:

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Table 1

Type of personnel (staff)		1989	1990	1991	1992	1993	1994	1995
1. Senior managerial (including financial analysts)		4	5	5	6	6	6	6
2. Procurement		3	3	3	4	4	6	6
3. Legal		1	2	2	2	2	2	2
4. Mining:	Key staff	24	27	27	27	27	27	27
	Trainees/support	12	23	23	28	28	33	33
5. Processing:	Key staff	24	27	27	27	27	27	27
	Trainees/support	12	23	23	28	28	33	33
6. Scientists:	Key staff	11	11	11	11	11	11	11
	Trainees/support	8	15	15	15	15	15	15
Total		99	136	136	148	148	160	160

Note: Above dates are contingent on the sixtieth ratification or accession being made during 1989 and the Convention coming into force during 1990. Otherwise dates will have to be suitably adjusted.

8. Since the above figures represent the option that constitutes the heaviest drain on manpower resources, it is clear that at most the Enterprise's requirements in the period 1989-1990 would call for the training of 8 to 10 management staff, 48 engineers (24 in mining and 24 in processing, with the trainees being trained through on-the-job procedures) and 11 scientists. The later accretions, being only marginally incremental in nature, could be inducted into the team through on-the-job orientation procedures.

9. The lowest manpower figures are for the option where the work is done through a joint venture. These figures are as below:

Table 2

Type of personnel (staff)		1989	1990	1991	1992	1993	1994	1995
1. Senior managerial (including financial analysts)		2	2	2	2	2	5	5
2. Procurement		1	1	1	1	1	4	4
3. Legal		1	1	1	1	1	2	2
4. Mining:	Key staff	10	10	10	10	10	20	20
	Trainees/support						20	20
5. Processing:	Key staff	10	10	10	10	10	20	20
	Trainees/support						20	20
6. Scientists:	Key staff	4	4	4	4	4	4	4
	Trainees/support						5	5
Total		28	28	28	28	28	100	100

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10. In the above case the numbers of management staff, mining engineers, processing engineers and scientists to be trained in the period 1989-1990 would be 4, 10, 10, and 4 respectively.

11. It should be noted, however, that the upper and lower bounds of the likely training requirements are based on the requirements of one mining operation and are subject to a variation of -40 per cent to +100 per cent. Besides, the years in which the manpower is to be trained are subject to the date of the sixtieth ratification of or accession to the Convention, the technology acquisition strategy and the operating option. The figures presented in this paper, therefore, serve only to highlight the orders of magnitude of requirements rather than as an input for a firm decision on training which would have to await the firming up of the figures and their sequencing, consequent on further studies and detailed project reports.

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LOS/PCN/SCN.2/WP.9
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Preparatory Commission for the International
Sea-Bed Authority and for the International
Tribunal for the Law of the Sea
Special Commission 2
Geneva, 12 August - 4 September 1985

IMPLEMENTATION OF PARAGRAPH 12 OF RESOLUTION II: TRAINING

Working paper by the Secretariat

CONTENTS

	Paragraphs	Page
Introductory Note	1 - 3	220
Manpower requirements of the Enterprise	4 - 10	220
Defining the role and scope of the registered pioneer investor obligation to provide training	11 - 12	222
Designing a training framework	13 - 15	222
Preparations for designation of personnel	16	223
Activating a training programme	17 - 19	223

Annexes

I. Information on expertise associated with deep sea-bed mining 225

II. Responses of delegations to enquiries made by the Secretariat (Australia, Colombia, Gabon, Zimbabwe, Cuba, USSR, France, Netherlands) 226

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Introductory Note

1. For the purposes of its present agenda (see paragraph 9 of LOS/PCN/L.20), specifically its item 2 (b), "Implementation of paragraph 12 of resolution II: Training", the Special Commission had asked the Secretariat to prepare a supplementary paper on training on the basis of discussions at the Third Session and of the advice and information provided by interested delegations. Paragraphs 8 and 23 of LOS/PCN/L.20 refer.

2. Earlier working papers prepared by the Secretariat have given considerable attention to the question of training, in particular Part II of LOS/PCN/SCN.2/WP.2 and LOS/PCN/SCN.2/WP.8, "Training needs and requirements of the Enterprise", which is linked in its approach to LOS/PCN/SCN.2/WP.6. Since the establishment of Enterprise training needs and consequent requirements is contingent upon assessments of its manpower requirements (see agenda item 1 (b)(i)), consideration of operational options is also relevant to the implementation of paragraph 12 in this regard. Similarly, attention is drawn to LOS/PCN/SCN.2/WP.7, since preparatory training measures designed to meet the manpower requirements of the Enteprise form part of the approach to be taken to the conduct of general feasibility work and planning for the Enterprise, whether through the establishment of an ad hoc core group of experts or through organized use of expert services (agenda item 2 (a)).

3. This paper briefly summarizes the main elements of Special Commission 2's consideration of the training question to date. Such additional information and advice as has since been available to the Secretariat is presented in Annex I. Responses of interested delegations to an enquiry made by the Secretariat have been taken into account to the extent possible, given the time available to do so. These replies are reproduced in extenso in Annex II to this paper.

Manpower requirements of the Enterprise

4. The training question is posed by the need to ensure that the manpower requirements of the Enterprise are met, as part of the basic objective set forth in the Preamble to resolution II and in the chapeau to its operative paragraph 12.

5. Emphasis has been placed on the particular importance of meeting the initial requirements of the Enterprise in order to ensure that its decision-making mechanisms are able to operate from its inception. Thus, development of an expert core group has been suggested, as a means of ensuring that the necessary management and technical plans are in place thereby enabling the Enterprise to get off the ground without delay. Similarly, it has been suggested that, at an appropriate point, personnel are designated to undergo special training in order to provide the pool of expertise specifically needed by the initial Enterprise.

6. A rough estimate put that first establishment at approximately 30 staff, including management.

7. This kind of approach has been discussed in some detail in previous working papers, primarily LOS/PCN/SCN.2/WP.7 and LOS/PCN/SCN.2/WP.8, emphasizing throughout, as previously also in paragraph 13 of LOS/PCN/SCN.2/WP.2, that any such preparations by the Preparatory Commission should not have the effect of imposing a definitive structure on the Enterprise, or of committing it to any one operational course, but rather of ensuring flexibility. Since the best assessments of the early manpower

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requirements of the Enterprise would stem from the results of general feasibility work, the degree of delineation of an initial mine site(s) for the Enterprise as a consequence of resolution II (particularly its paragraph 12 (a)(i)), and from other important timing factors, it has been suggested in the previous working papers that definitive action by the Preparatory Commission with respect to the provision of specialized training would be best implemented in the year before entry into force of the Convention or just prior to the expected commencement of the actual mining activities of the Enterprise, whichever is appropriate in the circumstances. This however requires certain prior actions by the Preparatory Commission with respect to:

(a) Identifying areas and levels where the required skills may not be readily available in sufficient numbers to absorb normal attrition rates, and from a sufficient number of countries to ensure equitable geographic distribution in the future Enterprise;

(b) Requirements and procedures for opening a roster of candidates for designation;

(c) Establishing the general modalities of a training programme, the terms and conditions for the provision of special training and the specific requirements of each registered pioneer investor thereunder, taking account of their obligations under paragraph 12 (a)(i) and (iii);

(d) Preparing rules, regulations and procedures on initial organization, management and staffing to enable the Enterprise to expedite the initial recruitment process;

(e) Promoting training opportunities to expedite the Enterprise's continuing requirements for trained personnel.

8. All such actions require extensive prior investigation and consultation, particularly with registered pioneer investors and also, as recognized by the Special Commission, with countries experienced in manpower planning for large-scale mining projects, so that the training question is understandably a priority issue for Special Commission 2.

9. It would seem advisable to make a distinction for training purposes (as in paragraph 3 of LOS/PCN/SCN.2/WP.8) between the first set of Enterprise manpower requirements (the initial, central planning and evaluation staff), and the second set of requirements which would be given definition only by the go-ahead decision on operations. It follows that the second set of requirements would continue to be best dealt with under the Special Commission's agenda item 1 (b)(i) and the first set under agenda item 2 (b).

10. Such a distinction does not however restrict the scope of the investigations necessary to establish a roster and develop a training framework; the distinction would apply subsequently when deciding who would be designated (and when) to receive special training in the preparatory period, from registered pioneer investors. Should timing factors so dictate, and registered pioneer investors are called upon to fulfil all or part of their training obligations in a period overlapping with that in which the Enterprise is positioned to take decisions on operations, the registered pioneer investor's obligations would merge with training to be provided within its plan of work, with implications also for any working relationship established between the three obligations set forth in paragraph 12 of resolution II.

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namely those concerning exploration, training and transfer of technology. For a discussion of this potential relationship see Part III, section B of LOS/PCN/SCN.2/WP.2 and LOS/PCN/SCN.2/WP.8, particularly its paragraph 5.

Defining the role and scope of the registered pioneer investor obligation to provide training

11. It may be assumed, for the meantime, that emphasis should be on training provided in the preparatory period with the objective of ensuring that the pre-operational manpower requirements of the Enterprise are met. None the less, an important question to be addressed is whether the implementation of the registered pioneer obligation might not theoretically be phased to meet both the pre-operational and operational situations. Clearly, the obligation of a registered pioneer investor is not unlimited. A more finite definition needs to be given to it and sufficient flexibility to ensure that the timing of fulfilment of the obligation is in the best interests of the Enterprise. A fundamental basis for such definition might be the cost/benefit factors involved, i.e. costs for the registered pioneer investors as against guarantees provided the Enterprise. Should it prove advisable to add or absorb some of the training obligation within the terms of the plan of work submitted to the Authority by the registered pioneer investors, the Preparatory Commission would have to provide for this.

12. In the discussions of the Special Commission, it has already been remarked that in view of the highly sophisticated nature of technology and management required for deep sea-bed mining, it is not so much the quantitative but the qualitative aspects of manpower development for the Enterprise that must be given attention. It follows, therefore, that the personnel to be trained for sea-bed mining would already have attained a certain level of proficiency in the required disciplines. The qualitative requirements of assuring the highest possible standards and of providing training opportunities in important highly specialized technical and engineering fields, may involve comparatively small numbers of people. The advice and information of pioneer investors and other countries with comparable experience, as to types and levels of skills required, will be of great assistance in the establishment of training needs for the Enterprise. It would also assist in the designation and allocation of personnel to education/training institutions, specialized courses, or on-the-job training, as appropriate.

Designing a training framework

13. This would firstly require identification of the categories and levels of personnel required by the Enterprise in its pre-operational phase, and those potentially required for the early phases of its operations, taking account of variations dictated by different operational modalities. Those cases requiring longer lead time for training and/or orientation should be indicated where possible, as also those cases where highly specialized training, unique to sea-bed mining, is indicated. A general understanding as to the cost-effectiveness of a training programme designed to meet Enterprise requirements would be desirable. The general approach adopted to training would also require matching the pace and extent of training activity to the results of feasibility work on operational needs, as well as to developments in sea-bed mining generally, as they would largely determine the number of opportunities available for on-the-job training in highly specialized technical and engineering fields.

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14. Also a necessary pre-condition for designing a training framework is to determine the extent of useful involvement by existing academic and technical institutions and actual opportunities for supplying appropriate training in the disciplines involved. The list of such potentially useful institutions is very long. For example, UNDP's newly established computerized Information Referral System (INRES), 1/ containing institutional data from developing countries on education and training courses, research and technological development services, and consultancy and expert services, has identifed a total of 159 institutions which undertake such activities in the field of metallurgy and mining: 84 in metallurgy and 42 specifically in marine minerals and mining. While there is no equivalent United Nations or agency information system giving similar information for developed countries, it can be safely assumed that there are a substantial number providing training and related services in relevant fields.

15. Possible methods for the development and promotion of specialized training courses, with the assistance and involvement of registered pioneer investors, would need to be considered to meet needs in the early phases of project development. In this context it should be noted that the incidence of special training courses, in the marine hard minerals sector, has increased in recent times because of the new efforts to assess and to develop the resources of the exclusive economic zone and continental shelf. Topics of some recent training courses range from basic geological and geophysical research to the design of national ocean minerals policies; often the minerals studied include manganese nodules and crusts. The cruise portion of some courses enable participants to gain practical experience in marine geophysics, mineral sampling methods, data interpretation and planning of marine research projects.

Preparations for designation of personnel

16. Having identified the disciplines and levels involved, these then would need to be complemented by investigations as to:

(a) Appropriate basic qualifications/experience which candidates for training in each category would be expected to have;

(b) Overall numbers to be placed on the roster for each category;

(c) Inscription methods, which may have to take account of the need for efficiency and broad participation;

(d) Desirable terms and conditions for those accepting designation following their inscription.

Activating a training programme

17. Timing factors assume a particular importance. Besides the relationship with the effective date of commencement of the Enterprise, and the influences exerted by pace of pioneer investor activity and assessments of the viability of sea-bed mining, account would need to be taken of the required duration of different types of training and of the need to account for the obsolescence and attrition of manpower normally associated with fast developing and high technology industries.

18. Activation of a training programme also requires decisions as to the specific obligations of each pioneer investor, the possible role of the United Nations Secretariat and of other organizations of the United Nations system.

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19. The training programme would need to be constantly reviewed. Once activated there would be no guarantee that developments affecting the Enterprise would proceed in an orderly, uninterrupted fashion.

Notes

1. User information for UNDP/INRES is given in a booklet entitled "Operation and Use of the Computerized Information Referral System (INRES)", obtainable from UNDP, New York.

Annex I

INFORMATION ON EXPERTISE ASSOCIATED WITH DEEP SEA-BED MINING

1. The Secretariat has reviewed available information in the public domain concerning expertise that has been used in activities relating to the investigation, analysis and evaluation of deep sea-bed resources, and to the determination of the technical and economic feasibility of exploitation. Although the actual functions such personnel have performed concern the requirements of pre-exploitation phases, some typical backgrounds and areas of concentration derived from this information may none the less have relevance for Enterprise manpower development.

2. The personnel primarily involved, most of them holding advanced degrees, appear to have come from diverse backgrounds, but with experience that focusses on the planning, development and management of large-scale projects, particularly those entailing advance systems and equipment design and evaluation. The teams that were formed (approximately 30-40 persons) provided management and support for marine science and resource definition, ship systems and equipment design and demonstration, and for the marine operations required for resource evaluation and systems testing. The disciplines primarily involved are electronic, mechanical and chemical engineering, mining and marine geology, oceanography, biology, mathematics and computer science. Their backgrounds vary: academic and research institutions; laboratories; land and offshore mining (hard minerals and petroleum); complex high technology industries such as aerospace; the shipping sector, including naval architecture and engineering; and the metallurgical industry.

3. General managers show backgrounds in the technical and economic assessment of new projects; and in the planning and management, including cost monitoring, of major research projects and mining projects, both on-shore and offshore. Many of the scientists involved have highly developed skills in information and data systems design and management and software development, as well as in resource evaluation techniques including the application of geo-statistics. Engineers and technicians come from the mechanical, electronic and chemical fields of this discipline. Their areas of concentration have been structure and systems aspects of new project development, primarily in the offshore oil industry but also in on-shore projects. In general they have extensive experience in programme feasibility analysis, in design and testing of complex systems, including supervision of at-sea testing and safety analysis management of various marine projects. Some have had extensive prior command at sea. Technical skills are primarily electronic, laboratory and mechanical: electronic technicians build, repair and maintain electronic equipment used for surveying and laboratory work and engineering tests; laboratory technicians prepare samples and operate equipment for chemical and other analyses; mechanical technicians repair, maintain and operate survey and test equipment. Consultants have been primarily used for specialized skills such as computer software development.

4. With respect to processing, the chemical engineers primarily involved have had extensive backgrounds in process simulation and evaluation, and in project development.

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Annex II

RESPONSES OF DELEGATIONS TO ENQUIRIES MADE BY THE SECRETARIAT

Note by the Secretariat

1. In accordance with the request of Special Commission 2 (LOS/PCN/L.20, paragraphs 8 and 23) the Secretariat sought advice and information from the delegations of France, India, Japan and the Soviet Union as well as the delegations of Belgium, Canada, Italy, and the Netherlands and of some other Member States of the Commission in view of their experience in planning for large scale mineral development projects. Replies were received (as of 13 August) from the delegations of France and the USSR, and from the delegations of Australia, Colombia, Cuba, Gabon, Netherlands and Zimbabwe (see below). Since most of these responses were not available to the Secretariat in sufficient time for full account to be taken of the information and advice given therein, this additional Note is included to facilitate the discussions of the Special Commission.

2. Attention of the Special Commission is drawn to the responses of the delegations of France and the Soviet Union, applicants for registration as pioneer investors.

3. The delegation of France has assured the Commission, on the advice of l'Association française pour l'étude et la recherche des nodules (AFERNOD), that the required training would be done through l'Institut francais pour la recherche et l'exploitation des mers (IFREMER). Training should however be directly related to the manpower needed to establish the Enterprise; any increases in training efforts would come in response to the progress of events under resolution II and to developments in the sea-bed mining sector. On the latter point, the delegation of the Netherlands, in its response, has emphasized that for training to be effective and efficient, especially technological training and on-the-job training, due regard must be paid to the expected time of commercial production.

4. The delegation of the Soviet Union emphasized that the terms and conditions for the training of personnel for the Enterprise, and the specific requirements of the Soviet Union in this respect, could only be discussed and decisions taken following the registration of its application. Assurances are given as to the availability of relevant institutional support. Concerning a possible linkage between the obligations of paragraph 12 to train and to explore a reserved area, the delegation has pointed out that there would be no need to include exploration specialists on the staff of the Enterprise since exploration would already have been done. Rather, the emphasis should be on the manpower requirements of exploitation. The Special Commission may wish to note the suggestion that the Secretariat pay particular attention to the manpower requirements of those operational options that seem most favourable, since time did not permit the Secretariat to act on this suggestion for the purposes of the present paper. The advice that training of engineering and technical personnel requires special attention accords with the impressions of the Secretariat. The need to take account of the costs that would be involved in providing specialized training has been recognized (see paragraph 11 above), as also by the delegations of Colombia and Gabon. Finally, it may be noted that the delegation of the Soviet Union (and other delegations) has drawn attention to the fact that training is a component part of transfer of technology (as affirmed in Annex III, article 5, paragraph 8 of the Convention).

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5. Particular attention, it is suggested, may be given to some similar points which emerge from more than one of the responses. Concerning Enterprise requirements and the availability of appropriate personnel to meet them, several delegations have noted that many skills are common to any large-scale operation and its organization, so that it may be possible to assume that in those instances personnel would be forthcoming and not need special training. It would appear from several responses that there may be no major problem as to the availability of many types of skilled personnel from developing contries, although some training or orientation in sea-bed mining may be required. The delegation of Cuba also refers to a possible additional need for training in "modern enterprise management techniques". There appear to be few problems with the availability of qualified personnel in non-ferrous metallurgy and extraction processes for the metals involved. No problem is envisaged as to the availability of judicial and legal experts.

6. Less readily available personnel would be in areas of exploration, research and development, and mine planning, as well as in those areas of engineering which must be considered highly specialized. One delegation (Australia) has broadly categorized the instances where specially acquired skills would be needed: (i) where the skills needed are not normally associated with the basic disciplines involved; and (ii) where skills in a particular areas would have to be greater than for land mining or other comparable operations. The nature of special training to meet these requirements could be usefully discussed, including that which can be accomplished prior to the availability of direct on-the-job opportunities.

7. With respect to training carried out in academic and technical universities and institutions, it is the view of the delegation of the Netherlands that it would be difficult to identify those that would be most appropriate until there is a definite list of the necessary skills which training would address; indeed, a definitive inventory of institutions could only be drawn up when mining activities start.

8. The Special Commission may wish to note the ways in which several delegations have distinguished among the different types of personnel required since these have implications for the possible structure of the Enterprise. For example, the delegation of Australia has included a "possible organization chart" in its response.

9. Several delegations point to the relationships between the three provisions of paragraph 12 (a) and to the need to specify the elements that should be encompassed by the training process. Active collaboration of pioneer investors with the Preparatory Commission on Enterprise matters in general is suggested: on exploration, technology, administration, and exploitation, marketing and processing operations, as well as on financing needs. The delegation of Gabon also considers it advisable for the Preparatory Commission to maintain close contacts with Governments on training matters, as well as on technology acquisition and Enterprise financing.

10. The role of a possible nucleus expert core group is noted by the delegation of Zimbabwe, which makes specific proposals on such a group and on a staged training programme, which could produce its "understudies".

11. Several of the responses express concern as to the effects of undue delays in the registration process on the ability of the Preparatory Commission to take practical and timely measures for the Enterprise.

12. Finally, the Special Commission may wish to take note of the several instances where delegations, in these responses, have raised issues which have a bearing on other items of the agenda.

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COMMUNICATION DATED 17 JULY 1985 FROM THE DELEGATION OF AUSTRALIA

[Original: English]

The Enterprise will be involved in the mining of manganese nodules from the ocean floor, transportation of the nodules to land and the extraction of certain metals from the nodules. It is assumed that the Enterprise carries out these three operations. It may decide to contract outside agents to carry out any of the three operations. A possible organization chart showing the basic tasks within the Enterprise follows at the end of the text.

The various activities within the Enterprise can be divided between production and support services. The majority of the support services are common to any sizeable operation/organization. The only specialist support areas would be mine planning/exploration and research and development. Certain areas of engineering will be specialized.

The skills required in each section of the operation are detailed in the list below. (All items identified with an asterisk are skills not normally found in that discipline or require above-average skill in a particular area.)

1. PRODUCTION SERVICES

(a) Mining Section

(i) Mining operations - Mining engineer

Knowledge of: Ocean topography/geology*
Collector characteristics/operation*
Slurry handling in marine environment*
Ship navigation and steering*
Personnel management
Costing
Scheduling
Engineering

(ii) Ship operations - Master of Ship

Knowledge of: Ocean navigation, etc.
Intership transfer of supplies at sea*

(iii) Maintenance

a. Mechanical engineer

Knowledge of: Mechanical engineering
Submersible pumps*
Slurry handling systems*
Ship's engines operations
Maintenance programmes

/...

b. Electrical/electronic engineer

Knowledge of: Electrical/Electronic engineering
Computer maintenance (including navigational systems, process control systems)*
Ship's power system*
Maintenance programmes

(b) Transport Section

(i) Ship operations - Master of Ship

Knowledge of: Ocean navigation, etc.
Intership transfer of supplies at sea*

(ii) Maintenance - Marine engineer

Knowledge of: Marine engineering
Maintenance programme
Workshop operations

(iii) Port operations - Harbour-master

Knowledge of: Harbour-master duties

(c) Processing Section

(i) Process operations - Metallurgist

Knowledge of: Metallurgy
Mineral processsing
either Hydrometallurgy*
or Pyrometallurgy*
Process control systems
Personnel management
Scheduling
Costing

(ii) Maintenance

a. Mechanical engineer

Knowledge of: Mechanical engineering
Heavy industry (smelter maintenance for pyrometallurgical process)
Personnel management
Scheduling/Maintenance programme
Costing

/...

b. Electrical engineer

Knowledge of: Electrical enginering
Power supply
Personnel management
Scheduling/Maintenance programme
Costing

c. Electronic engineer

Knowledge of: Electronics engineering*
Instrumentation maintenance*
Process control system maintenance
Personnel management
Scheduling/Maintenance programme
Costing

2. SUPPORT SERVICES

(a) Engineering Section

(i) Mechanical engineer specializing in:

- a. Mining system
- b. Process system

(ii) Marine engineer

(iii) Naval architect

(iv) Electrical/electronic engineer

(v) Civil engineer

This section would initially be involved in specifications for the setting up of the project. The work would be required to continue after production starts in a smaller capacity. Some of the work of engineering would be in conjunction with research and development.

(b) Personnel and Industrial Relations Section

(i) Industrial Relations Officer

Knowledge of: Industry practice

(ii) Personnel officer

Knowledge of: Recruitment
Employee welfare
Personnel systems

/...

(c) Accounts and Purchasing Section

(i) Accountant

(ii) Purchasing officer/Inventory control officer

(iii) Computer programmers etc.

(d) Safety Section

Safety officer

Knowledge of: Safety programmes
Industrial experience

(e) Research and Development Section

(i) Mining (collector design development)

Mining engineer

Knowledge of: Mining engineer (general)
Soil mechanics*
Slurry handling*
Ocean environment*

(ii) Processing metallurgist

Knowledge of: Metallurgy
Mineral processing
either Hydrometallurgy*
or Pyrometallurgy*

(iii) Assaying/Chemistry (nodule assaying/process quality control)

Chemist/Chemical engineer with specialized knowledge of assaying of manganese nodules

Chemist/Chemical engineer specialized in process control

(iv) Environmental Control

a. Chemical oceanographer specialized in: pollution in oceans

b. Environmental control officers specialized in:

i) Air pollution

ii) Water pollution

iii) Waste dump revegetation

/...

(f) Exploration and Mine Planning Section

(i) Marine geologist

(ii) Geostatistician

(iii) Computer programmer

(iv) Mining engineer specialized in:

Mine planning

Marine mining

(v) Surveyor specialized in ocean floor surveys

(vi) Exploration ships co-ordinator

Knowledge of: Sea cruises
Ocean floor sampling techniques

(g) Corporate Planning, Finance, Marketing, Etc. Section

(i) Corporate planning - lawyer

(ii) Financial manager

(iii) Marketing specialized in metal trading

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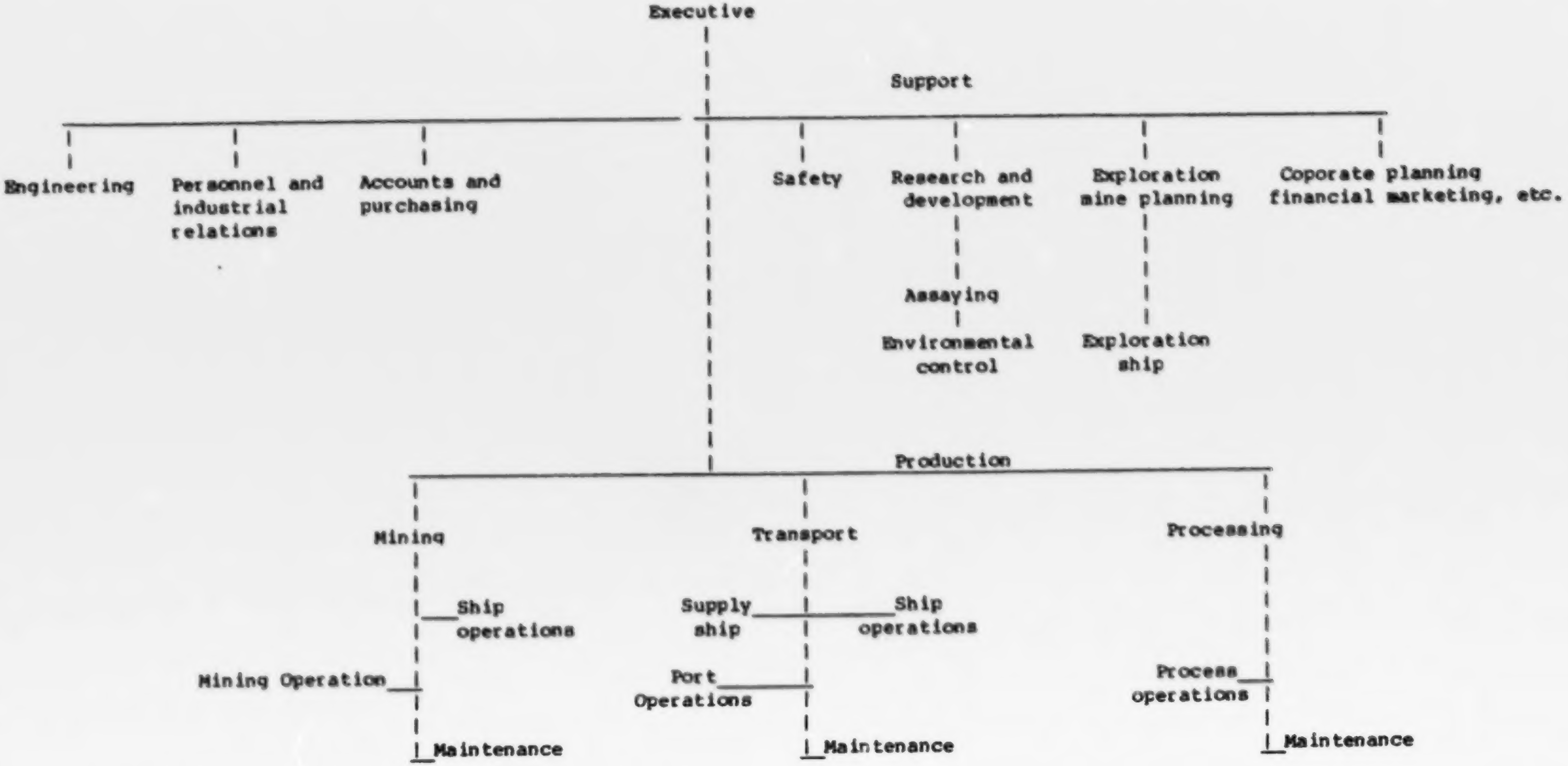
POSSIBLE ORGANIZATION CHART


Executive
Support
Engineering
Personnel and industrial relations
Accounts and purchasing
Safety
Research and development
Assaying
Environmental control
Exploration mine planning
Exploration ship
Coporate planning financial marketing, etc.
Production
Mining
Ship operations
Mining Operation
Maintenance
Transport
Supply ship
Ship operations
Port Operations
Maintenance
Processing
Process operations
Maintenance

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EXTRACT FROM COMMUNICATION DATED 4 JULY 1985 RECEIVED FROM THE DELEGATION OF COLOMBIA

[Original: Spanish]

We have studied document LOS/PCN/L.20, paragraphs 8 and 23.

Some questions have arisen in connection with training, which is a matter of priority for Special Commission 2. In order to provide suitable answers to these questions, we have arranged this paper under seven specific headings, enumerated below in a systematic manner so as to provide a suitable answer to each one:

1. Selection of personnel for training. Mandated by resolution II.

2. Selection of areas of training. Viz.: administrative.

3. Selection of levels of training. For example: operational management and service.

4. Selection of type or method of training. Viz.: formal education courses, regular courses, exchanges, seminars, dissemination of written materials, in-service training.

5. Selection of training locations and sites and of instructors.

6. Determination of the extent of obligations of pioneer investors. Viz.: the amount or cost of training in each case and duration.

7. Definition and reaffirmation of the various aspects of the transfer of technology - article 266 of the Convention, part XIV.

Answers

1. Training will be provided for those who, subject to the Enterprise's requirement concerning strict observance of the principle of equitable geographical distribution, are found to meet the conditions and have the technical qualifications and the background required by the Authority, as a result of competitive examinations to be held at each level.

A similar procedure will be followed in the selection of those seeking justifiable promotion at each level. (The success of any enterprise depends on staff development in the scientific, technological and administrative fields, so that the highest standard is constantly maintained.)

2. Selection of training areas relevant to item 3 (levels) below. For example:

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Technical area:

Exploration
Exploitation
Marketing
Processing

Administrative area:

Planning
Execution
Evaluation
Socio-legal
Economic and financial

The first and second, taken together, give us:

General research, and
Overall evaluation.

3. Levels might include:

(a) Executive: Director, Deputy Director, (staff); this is the conceptual area;

(b) Operational: those engaged in management, viz.: in banks, cashier, current accounts personnel, systems personnel, etc.;

(c) Service: providing support for the above management areas.

This item is directly linked with the areas dealt with in item 2 of this study.

4. This item is explained by the examples referred to above.

5. Training locations. In determining these we must bear in mind that training must initially take place under the programmes carried out by the pioneer investors. Then, at a later stage, the Enterprise will consider the establishment of training centres, in consultation with regional facilities in the various technical, scientific and administrative specialities (thus establishing development centres in these fields in third world countries).

6. Obligations of the pioneer investors

We consider that resolution II, paragraphs 12 (a) (i), (ii) and (iii), does not adequately specify the various areas to be included in the training process. We therefore feel that the pioneer investor should collaborate at all times with the Preparatory Commission, the Authority and the Enterprise, not only in the field of exploration dealt with under that item but also in the other areas, such as administration, exploitation, marketing and processing, listed under item 2 of this study.

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7. Transfer of technology

The obligation regarding the transfer of marine technology, stated in part XIV of the Convention and dealt with in resolution II, paragraph 12 (a) (iii), will involve not only the transmission of scientific and technical knowledge and theories as such, but their actual transfer, that is, they must be adapted or amended for practical use by the recipients of the transfer.

These, in general terms, are the aspects to be followed up and studied when we consider paragraphs 8 and 23 of the above-mentioned document in Special Commission 2.

COMMUNICATION DATED 27 JUNE 1985 RECEIVED FROM THE DELEGATION OF GABON

[Original: French]

General Assembly resolution 2749 (XXV) of 17 December 1970 must be the basis for discussions in the Preparatory Commission.

In adopting the Declaration of Principles Governing the Sea-Bed and the Ocean Floor, and the Subsoil Thereof, beyond the Limits of National Jurisdiction, the General Assembly set forth three guidelines to be observed scrupulously, including the exploitation of the sea-bed for the benefit of mankind as a whole, taking into particular consideration the needs of the underdeveloped countries, in accordance with article 140 of the United Nations Convention on the Law of the Sea.

It is essential to remember the historic compromise reached at the Third Conference, namely, the acceptance by the Group of 77 of the parallel system for financing the Enterprise, the transfer of technology and the training of personnel by the industrialized countries.

At the current stage, the latter must demonstrate their good faith to the Preparatory Commission by giving it official guarantees with respect to the above-mentioned three points and by specifying that they are closely connected.

Deriving like the other two points from the provisions of paragraph 12 of resolution II, the question of training raises many issues regarding the practical measures to be taken in the interim period preceding the establishment of the structures of the Enterprise, namely: Who is to be trained and why? On what types of disciplines will the training be centred and why? From where, when, how and why will the training be effected? Who, in the final analysis, will designate the personnel to be trained and why? Who will assume and finance the training, when and why? Is it an integral part of the transfer of technology and why? Will the countries benefiting from this training assume a part of the expenses, how and why?

It goes without saying that the Preparatory Commission will have to designate the personnel to be trained on the express recommendations of the Governments of

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the member countries represented on the Council, the Economic Planning Commission and the Legal and Technical Commission, in accordance with the provisions of articles 161, 163, 164 and 165 of the Convention.

It is essential, therefore, that as of now, the Preparatory Commission maintain close contact with those Governments with a view to adopting a co-ordinated approach with respect to the training of administrative and technical personnel at the highest levels, the acquisition of technical know-how and the financing of the Enterprise.

For its part, Gabon is keenly interested in being a member not only of the Council, but also of the Economic Planning Commission, and its candidate will be chosen by the Government on the basis of his competence and designated in the final analysis by the Preparatory Commission.

In the spirit of the above-mentioned compromise, pioneer investors have an obligation to ensure and finance training and should not lose sight of the importance of the interim period while awaiting the exploitation of the sea-bed.

The training must be continued during the post-operational phase, and the requirements will then be defined by the Enterprise itself.

The interim period is of great importance and must receive the attention of the Preparatory Commission, since the entry into force of the Convention and the registering of pioneer investors seem to have been deliberately and unduly delayed, and may be even further.

If the Preparatory Commission is forced to continue to await the registering of pioneer investors in order to take practical measures, that would be fatal for the Enterprise.

Even though financial problems may arise, they should be overcome with the assistance of the United Nations Development Programme, the United Nations Industrial Development Organization and many other institutions.

In this connection, it should be noted that the financing of the Enterprise, in order to make it operational from the outset, should in no way be limited to verbal guarantees offered by the industrialized States and the loans which the Enterprise should be able to obtain from finance organizations to cover the expenses of initial investments.

It has also been said that the Enterprise must derive profits from initial exploitation in order to continue the exploitation of sites of the Authority and that the Enterprise itself will have to assume debt-service and obtain exploitation technology on a payment basis.

We must a priori acknowledge that such a financing system cannot ensure the immediate viability of the Enterprise, because it will be difficult for the latter to find immediately a partner that would agree to transfer technology to it, on the one hand, and, on the other, to raise quickly the funds to launch a second operation after the first, unless there is a spectacular increase in the price of metals.

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There could therefore be no question of the Enterprise concluding service contracts or establishing joint ventures, without the transfer of technology, leaving it to private contractors to assume the responsibility of raising the necessary capital for commercial exploitation.

Working on behalf of and in the interest of all mankind, the Enterprise must have full authority to conduct activities in the Area and to have access to the necessary technology.

In adopting a co-ordinated approach covering the three elements, the subject of a historic compromise, a careful study must be made, to include the official views of the Parties concerned (pioneer investors) on how to guarantee practical training and the transfer of technology to, and financing of, the Enterprise.

The Preparatory Commission must have proof of good faith and good will in order to establish trust among the parties involved.

The Preparatory Commission should itself supervise and collate the practical training programmes submitted by the pioneer investors, in co-operation with institutes or schools of established standing covering the disciplines of genuine interest to the Enterprise, particularly those concerning mining technology (geology, extraction, processing), management (finance, planning) and transport. Reference should be made to articles 163, 164 and 165 of the Convention with respect to the qualifications required of candidates to the Economic Planning and Legal and Technical Commissions.

Under the provisions of annex III, article 15, and article 144, paragraph 2, of the Convention on the Law of the Sea, the obligation of future users of the sea-bed to transfer technology to the Enterprise and to the developing countries should cover the interim period because the Enterprise is able to make this transfer effective, given the possibility, under the sponsorship of the Preparatory Commission, of qualitative and quantitative practical training for personnel from developing countries.

Nevertheless, the rich countries should neither regard the technology as an economic asset - a retarding factor that would jeopardize the outcome of the work of the Preparatory Commission - nor feel that the Convention contains spoliatory provisions or that training is a function of the right of these countries to protect their moral and material interests resulting from any scientific output of which they are the originators.

The community as a whole must participate fully in scientific progress, an integral part of the common heritage of mankind, and in the benefits deriving therefrom, in accordance with article 13 of the Charter of Economic Rights and Duties of States adopted by the United Nations General Assembly in resolution 3281 (XXIX) of 12 December 1974, which recognizes the right of the underprivileged countries to enjoy these advantages in order to accelerate their economic development, and with article 9 of the Universal Declaration of the Rights of the People of the Non-Aligned Countries (Algiers, 4 July 1976) which provides that since scientific and technical progress is part of the common heritage of mankind, every people has the right to participate in it.

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Declaration of the Organization of African Unity

I should like to recall that the Declaration of the Organization of African Unity, adopted at the Extraordinary Meeting of the OAU Council of Ministers on the Law of the Sea, held at Nairobi (Kenya) on 3 and 4 March 1979 provides that the African States consider that in order to avoid monopoly by the nationals of the industrialised countries in the functioning of the Authority in the technical fields of mining and processing as well as the negotiation of contracts relating to exploration and exploitation of resources in the Area:

1. A training programme for nationals of developing countries should be worked out forthwith to equip them in the skills needed for such functioning of the Authority and to meet the need for effective participation by the developing countries in all functions of the Authority, its organs and activities in the Area; and

2. To intensify any existing programmes in this field, including co-ordination of the efforts involved in these programmes.

COMMUNICATION DATED 7 JUNE 1985 RECEIVED FROM THE DELEGATION OF ZIMBABWE

[Original: English]

Resolution II, paragraph 12 (a) (ii) of the Third United Nations Conference on the Law of the Sea requires that every registered pioneer investor should provide training at all levels for personnel designated by the Commission. The purpose of this and allied provisions is to ensure that "the Enterprise is able to carry out activities in the Area in such a manner as to keep pace with States and other entities". Co-ordination of the terms of this provision forms part of the programme of work of Special Commission 2.

The initiative for implementation of this provision should be provided by the Preparatory Commission, which should formulate the criteria for selection of staff from Member States to undergo designated training by pioneer investors. Document LOS/PCN/SCN.2/WP.8 outlined tasks or objectives that would need to be discharged by the Enterprise in four phases, as follows:

Period	Expertise required
(i) 1990-1992	Technological forecasting, technology assessment, economic and financial evaluation of complex and futuristic technologies under conditions of uncertainty; preliminary design of feasible and economic mining and processing subsystems; establishment of infrastructural support networks; identification of suppliers of equipment; sub-system model tests; negotiations for technology acquisition; joint ventures, etc.

	Period	Expertise required
(ii)	1993-1995	Conducting and evaluating at sea tests; market surveys; updating designs; detailed project reports; forming of contracts with suppliers; arranging for funding (consumers credit; suppliers credit, bank loans, leasing equity); environmental impact statements.
	1996-2001	Finalization of designs and specifications; procurement of plant and equipment; construction of processing plant and on-land facilities; testing and start-up.
	2002-2022	Operation and maintenance of mining and processing systems; continuing exploration, research and development for possible updating of systems; marketing of products.

The dates in the four phases are based on the assumption that the Convention enters into force in the year 1990, that sea-bed mining will be commercially viable in the year 2001 and that the Enterprise will commence mining in the year 2002. Should there be delays in the preparatory stages leading to actual mining, the years indicated in the four phases can be adjusted. Conversely, if sea-bed mining were to commence earlier than the above schedule, the four phases would be implemented much sooner.

However, before entry into the phases, experts should be engaged to advise the Preparatory Commission on:

(a) Selection of sites;

(b) Research and appraisal of information and technology that would be required in the pre-phase period as from 1987 to 1989.

A small staff could form the nucleus core expert group and would be enlarged gradually, as circumstances require. This nucleus staff would be reinforced by personnel nominated by Member States that have been designated by the Preparatory Commission for training by pioneer investors. The trained personnel would form the reservoir or pool of expertise at the service of the Enterprise.

To fulfil the requirements of resolution II, paragraph 12 (a) (ii), recruitment of personnel for training cannot wait for the Enterprise and its Governing Board and Director-General to be functional because it must keep pace as far as possible with the activities of pioneer investors.

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Core expert group

To implement the foregoing observations immediate steps should be taken to attach the small core expert group to the Secretariat to assist in the preparation and analysis of technical documents and formulation of appropriate recommendations.

The basis for the selection of this personnel should be:

(a) Possession of relevant qualification and experience in one or more of the following mining disciplines:

(i) Mineral and mining economics;

(ii) Mining finance;

(iii) Mining engineering;

(iv) International law;

(v) Oceanography;

(vi) Marine geology;

(vii) Extractive metallurgy/Metallurgical processing;

(viii) Mining law and mining agreements;

(ix) Mine planning;

(x) Mine management;

(xi) Mineral production;

(b) Equitable geographical representation;

(c) Representation by developing land-based producers;

(d) The core expert group should consist of graduates and high-level technicians who, having the basic mining know-how, could be adapted to marine or sea-bed mining in the shortest possible time;

(e) A group of nine experts could be the minimum number with regard to (a), (b), (c) and (d).

Training

Less experienced personnel with basic graduate education in a mining discipline, nominated by Member States and to be designated for training by pioneer investors, should be recruited.

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A staged programme of training for each discipline, involving practical training on attachment, should be devised in consultation with each pioneer investor, who accepts the obligation.

A proper system of assessment is essential to ensure that know-how is actually transferred. It is from this group that understudies for the core expert group are selected.

The training ought to commence from the land-based operations of the pioneer investor and culminate in the sea and sea-bed operation.

The range of skills should comprise:

(a) Mineral and mining economics;

(b) General international law and international economic law, mining law and mining agreements;

(c) Oceanography;

(d) Finance;

(e) Cartography;

(f) Metallurgy;

(g) Marine geology;

(h) Mining engineering;

(i) Essaying;

(j) Surveying (especially underwater);

(k) Chemistry;

(l) Mechanical and electrical engineering.

Short courses

Short academic training courses could also be added and undertaken at various land-based institutions, both in the developed and developing countries, such as Colorado School of Mines, United States of America, Cambourne School of Mines, United Kingdom, Imperial College, United Kingdom and Institute of Mining Research, Zimbabwe.

COMMUNICATION DATED 11 JULY 1985 FROM THE DELEGATION OF CUBA

(Original: English)

Our country has some experience in the development of large mineral-metallurgical enterprises applied to land deposits. In the case of the Enterprise, certain specific peculiarities must be met, inter alia, those stemming from the initial or pre-operational stages which come after the first investors have been registered. They are required to observe the terms established with regard to training in paragraph 12 of Resolution II of the Conference on the Law of the Sea. In this regard, there should be a number of trained experts - marine geologists, mining engineers, oceanography engineers, economic engineers and other experts - capable of assessing, from the geological and mining viewpoints, the area allocated to the first investors in order to select the portion which will belong to the Enterprise.

Obviously the establishment of the Enterprise during the interim period will require an executive staff with sufficient experience and expertise so that their management will bear fruits and contribute to rendering the Enterprise profitable. Therefore the late recruitment of both the technical and administrative personnel during any of the stages envisaged, would have a negative impact on the Enterprise. This personnel, which is so abundant in developing countries, would also require some training in modern enterprise management techniques.

The staff to be recruited must have experience in different types of mineral ores; any experience in land mining would be most convenient.

We feel that training should begin as soon as possible and that the recruitment of personnel to be trained should observe the basic principles of Part XI of the Convention. An assessment should be made of the services available to the first investors to provide the training to which they are committed, which should not be mistaken with assistance given to developing countries.

Moreover, it would be indispensable to prepare a list of international organizations such as UNIDO, IOC, etc., universities and specialized institutions capable of providing training courses, indicating those that would be willing to do so.

The selection of the administrative staff and the timing for the training of the staff appointed by the Commission should form part of the steps leading to the selection of the candidates and the decision regarding their number. Training should be offered at all levels and should include all technological fields involved in the process.

It is also necessary to master the judicial and legal aspects involved in order to guarantee and support the establishment of the Enterprise. There are highly qualified jurists with law-of-the-sea experience, who could perform this function. However, they might require all technical and economic elements for the production activity of the Enterprise and would therefore also need training.

The industrial aspect also requires qualified staff in the field of non-ferrous metallurgy and in the extraction processes of nickel, cobalt, copper and manganese. Perhaps less training is required in this field since many countries have performed tests in the processing of manganese nodules, as in the case of Cuba, and because this metallurgical process is very similar to that of other land mineral ores.

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We consider that we must focus our attention, first of all, on the initial nucleus, whose duty is to set up the Enterprise and promote its operations, as well as on the experts and technicians who must work from the very beginning in the selection of the mining area, to ascertain its geological development and the technology which can be employed for the mining of the nodules and other operations leading to the processing.

Within the Conference on the Law of the Sea there were, and still are, highly qualified persons who could form part of the future Enterprise and who could guarantee a well-organized programme for the up-grading and training of the staff, which will undoubtedly be the main elements for its success.

We would like to suggest that the personnel who are to receive the necessary training to undertake the operations of the Enterprise should be divided into three groups:

- Executive staff
- Technical managerial staff
- Technical qualified staff for operations.

This last group could be divided into: Specialized technical staff, medium-level technicians and skilled workers in the different fields of future marine mining.

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COMMUNICATION DATED 7 AUGUST 1985 FROM THE DELEGATION OF THE UNION OF SOVIET SOCIALIST REPUBLICS

[Original: Russian]

The Soviet Union has an adequate network of educational establishments that could be used for the training of staff for the Enterprise and it would be willing in this respect to discharge its obligations under resolution II of the United Nations Conference on the Law of the Sea.

It must be emphasized in this regard that the Soviet Union could not discuss or approve the conditions for, or the specific nature of such training until its application has been registered, for paragraph 12 (a) (ii) of resolution II provides that only registered pioneer investors shall provide training at all levels for personnel for the Enterprise.

Your letter contains a request for particular attention to be devoted to "those aspects of staff training of special relevance to exploration". We should like to point out in this regard that, according to paragraph 12 (a) (i) of resolution II, every registered pioneer investor undertakes to carry out, at the request of the Preparatory Commission and for compensation, exploration within the relevant area of the sea-bed reserved for the Enterprise. Consequently, the Enterprise will have no need of its own exploration specialists. The Enterprise will require its own specialists only in relation to the exploitation of valuable minerals.

The competent Soviet authorities are of the opinion that, when the secretariat prepares the new document on the training of personnel for the Enterprise, it could link that question with the most preferable operational variant of the Enterprise by giving special attention to the training of engineering staff and defining in that connection the list of professions necessary for the extraction, transport and processing of ferro-manganese accretions and to the training of specialists in the spheres of environmental conservation, sales, finances, administration, law and economics. This will require the determination of the group of countries interested in training staff for the Enterprise and the evaluation of the costs of, and the arrangements for the financing of staff training, as part of the question of the transfer of technology in accordance with article 5, paragraph 8, of annex III to the Convention.

In considering the question of the training of staff in the USSR, it will also be necessary to make provision for the international recognition of the qualifications of the specialists who receive their instruction in this country.

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COMMUNICATION DATED 7 AUGUST FROM THE DELEGATION OF FRANCE

(Original: French)

It goes without saying that, as a pioneer investor, France is prepared to make a significant contribution to the training of the qualified technical staff needed for the smooth operation of the Enterprise. The *Association française pour l'étude et la recherche des nodules* (AFERNOD), which has been consulted in the matter, has indicated that the *Institut français pour la recherche et l'exploitation des mers* (IFREMER) would be in a position to provide further training for a number of specialists of unquestionable standing and experience. We take this opportunity, however, to mention that, in the present circumstances, we also believe that the effort put into training must not go beyond the actual requirements of the Enterprise in its initial phase and that any subsequent increase in that effort must be consistent with real progress in the implementation of resolution II and the introduction of the régime for the exploitation of the deep sea-bed.

COMMUNICATION DATED 9 AUGUST FROM THE DELEGATION OF THE NETHERLANDS

(Original: English)

Our thoughts have been considered against the background that training in skills relevant to sea-bed mining can only be effective and efficient if due regard is paid to the expected timing of commercial production. We have to be realistic and admit that production on economically viable terms can only be expected in the long run, taking into account *inter alia* the prospects for metal prices and the technological know-how in sea-bed mining. The timing aspect is of utmost relevance for training activities in the field of technological training. Training at this stage on existing methods of sea-bed mining can be highly irrelevant when we keep in mind that new technologies for possible future sea-bed mining activities will have been developed.

Furthermore, questions which have to be considered in the Special Commission 2 are *who* should be trained, *what* are the objectives of training and *where* should training be provided.

As indicated above, it seems to be highly questionable whether "on-the-job" training is advisable, efficient and effective at this stage of development of the sea-bed mining activities.

In the statement of the Chairman of the Special Commission 2, the view is expressed that such relevant information should be provided of the experience in planning large-scale mineral development projects. It has to be said that this experience is mainly in the hands of the private mining enterprises. The governmental experience in the Netherlands in this field is rather limited. Technical Universities have some experience in an academic way and training in this field at the Universities is possible. This is certainly also the case of

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other technical mining problems, which are dealt with in the mining sections of the Technical Universities. However, it has to be stated that there is a language problem which can be a serious barrier for foreign students as the Netherlands Universities require adequate knowledge of the Dutch language for students and postgraduates attending the courses.

At this stage, it is hard to say which University or institutions are competent for specific training courses as long as there is no defined list of desired skills or manpower and training requirements. This tentative inventory could be made more effective as soon as the operational arrangements of the Enterprise are known. A more definite inventory can only be made when mining activities will be started and clear views will exist as to the methods then to be used.

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LOS/PCN/SCN.2/WP.9/Add.1
15 January 1986

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEA-BED AUTHORITY
AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2

IMPLEMENTATION OF PARAGRAPH 12 OF RESOLUTION II: TRAINING

Working paper by the Secretariat

Addendum

ADDITIONAL RESPONSES OF DELEGATIONS TO INQUIRIES MADE BY THE SECRETARIAT

CONTENTS

	Page
Canada	249
Japan	251

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CANADA

Statement made on 2 September 1985 by the delegation of Canada

Canada is a significant producer of minerals and is also among those States which are prospective certifying States within the provisions of resolution II. In both of these capacities we received the Special Representative's letter of 2 May 1985 requesting information regarding training available in Canada for sea-bed mining activity to be undertaken in the Area. Our statement today represents our reply to this request and our initial thoughts with respect to document LOS/PCN/SCN.2/WP.9 entitled "Implementation of paragraph 12 of resolution II: training".

The relevant authority for this discussion of training is found in resolution II, paragraph 12, which states:

> "In order to ensure that the Enterprise is able to carry out activities in the Area in such a manner as to keep pace with States and other entities:
>
> (a) every registered pioneer investor shall:
>
> ...
>
> (ii) provide training at all levels for personnel designated by the Commission."

The basic training required for sea-bed exploration and mining is that required for any form of mining engineering, mining technology and processing activity as well as a range of sciences that may be applied to the oceans either in the offshore or deep sea-bed. There are many universities and technological institutes in Canada capable of providing the complete range of training for suitably qualified candidates using either the English or French languages. Developing countries with mining capabilities will be well aware that the Canadian International Development Agency has conducted numerous training programmes at the academic level as well as organizing practical training programmes within our federal Department of Energy, Mines and Resources, within provincial mining departments and private Canadian mining companies. More specialized mining training directed specifically toward deep sea-bed mining is not sufficiently advanced to be undertaken as an academic activity. Academic training is available that could be applied to the offshore and the same principles apply to the deep sea-bed. In fact, however, it is only the private mining companies themselves in Canada which have the necessary practical experience in the deep sea-bed to conduct research and prospecting activities and testing of various pilot methods for recovering and processing manganese nodules or any training which might be related to it.

Canadian companies are potential pioneer investors as indicated in resolution II, paragraph 1 (a) (ii). It would therefore be possible for them to provide part of the training for Enterprise personnel in the areas of

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specialization of such corporations. As many people in developing and developed countries are aware, Canadian corporations have a good record in training personnel. We would however wish to remind the Special Commission of two salient points:

1. As we noted in our Statement concerning Assumptions, commercial deep sea-bed mining is not an activity which is near at hand. The views of the Canadian Government experts in the field do not project that it will be commenced either by State or private enterprises at any point within the next 20 years for lack of commercial viability.

2. Canadian companies which are capable of providing deep sea-bed mining training for Enterprise personnel are not now "gearing up" for such activity. Indeed, they have themselves severely cut back resources, both personnel and financial, devoted to deep sea-bed mining.

This brings our consideration back to the basic premise upon which paragraph 12 of resolution II is based. It is that "activities" (training in this instance) are to take place in "such a manner as to keep pace with States and other entities". With the development of deep sea-bed mining by those entities currently capable of undertaking such projects at such a low level it is in our estimation highly premature both for the United Nations system in general and developing countries in particular to establish a training programme in the near future for Enterprise activity which is not likely to occur for at least a generation. Should the commercial viability of deep sea-bed mining show a marked improvement, then the situation would be re-evaluated and appropriate training programmes initiated. For the time being, an Enterprise, even staffed with only 30 personnel, would quickly find itself underutilized as we do not foresee significant activity taking place in the Area in the near term. It would seem more appropriate for a nucleus of a half dozen persons, drawn from existing mining organisations, to be formed.

This does not mean that there exists no need for any training. It is the view of the Canadian delegation that the Convention may come into force well before deep sea-bed mining by the Enterprise or any other entity begins. When this occurs, the Authority will take up its operations in Kingston. Article 157, paragraph 1 of the Convention states that the Authority shall, "organize and control activities in the Area, particularly with a view to administering the resources of the Area". The role of the Assembly and Council in organization is currently under the scrutiny of the Plenary of the Preparatory Commission and in any case would involve States parties on an individual basis within their own countries, obviating the need for a Preparatory Commission-sponsored training programme. However, the administrative functions of the Authority are to be undertaken by the staff of the Secretariat in accordance with article 166 (3). These functions will have to be defined by the Assembly and the Council. They will no doubt include analytical, organizational and regulatory activity not unlike that performed by the mining department of a State. Personnel to assume these roles will in the words of article 167 require the "highest standards of efficiency, competence and integrity. Subject to this consideration, due regard shall be paid to the importance of recruiting staff on as wide a geographical basis as possible". It is this group of personnel which will need training in the first instance and it is their training which we believe ought to receive the earliest consideration and highest priority. The exact size and composition of the Secretariat staff ought to be modelled on that of the regulatory parts of the mining department of any mining country with a similar amount of activity. Such training should also fit them for the other jobs required of resource managers so that they will be mobile. These trainees could be drawn from the ranks of existing staff in various countries, which would benefit developing countries in the short term as well.

Training programmes for Enterprise personnel would follow in due course when the need arises.

Canada as a signatory State to the Convention would be prepared to assume its share of the training of Secretariat personnel as we do now for personnel from various countries. We would envisage that such training would be undertaken principally by the appropriate government organizations in Canada which currently regulate land-based mining.

We also know that courses currently exist which have been completed by a number of people in various countries. It would be interesting to find out the number of such personnel who have been trained in relation to expected employment in the Secretariat or Enterprise.

It follows from our comments that we endorse the proposal in paragraph 7 of document LOS/PCN/SCN.2/WP.9 that definitive action regarding Enterprise training be taken "just prior to the expected commencement of actual mining activity by the Enterprise" when there will be registered pioneer investors prepared to provide appropriate training for Enterprise personnel. Timing factors therefore assume particular importance as paragraph 17 of the above-mentioned document so rightly points out. The timing is now appropriate to consider training programmes for Secretariat staff but it is premature for Enterprise staff.

JAPAN

Communication dated 29 August 1985 from the delegation of Japan

In light of the difficulties of specifying the timing of the commercial exploitation of polymetallic nodules and of the uncertainties surrounding such factors as the operational form of the Enterprise, this response is inevitably of a preliminary nature. Although the questions raised in your letter seemed to be focused on the aspect of exploration, due care should be paid to the fact that even the definition of exploration is not yet established in Special Commission 3.

1. Timing for training

The decision to start training should be preceded by good prospects for metal prices, which could make commercial operation of the Enterprise feasible. Special attention should be paid to the fact that the expected timing of commercial operation could be greatly relevant, so that training does not prove to have been of little use and a waste of effort, financial resources and manpower when commercial production actually starts.

/...

2. Areas of training

In light of the fact that a number of operational options are available to the Enterprise, it is to be noted that manpower and training requirements for the start-up of the Enterprise would differ greatly depending upon what form of operational arrangements the Enterprise would decide to choose.

3. Site for training

Introductory training could be given at universities, institutes, etc. As for on-the-job training, it would be an idea to have a pioneer investor provide it in conjunction with exploration of an area reserved for the Enterprise, as requested pursuant to resolution II, paragraph 12 (a) (i).

4. Qualifications for trainees

Qualifications for trainees should be determined taking into account the type and level of training to be given.

5. Cost-sharing

As to the cost-sharing of training, no principles have been stated, even in resolution II. In this regard, it would be an idea to employ the same or similar method as that provided in paragraph 12 (a) (i) of resolution II, whereby the costs incurred in connection with exploration activities carried out in the reserved area by a pioneer investor shall be reimbursed plus interest thereon at the rate of 10 per cent, so as to alleviate the financial burden of private companies involved in training.

6. Posting of trained staff

Adequate measures should be taken to ensure that trained staff be posted to the appropriate parts of the Enterprise.

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PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEA-BED AUTHORITY
AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2

THE ENTERPRISE

ECONOMIC VIABILITY OF DEEP SEA-BED MINING OF POLYMETALLIC NODULES

Submitted by the delegation of Australia

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ABSTRACT

This study, carried out by Mr. Peter D. Ingham, B.Sc., M.Sc., D.I.C., A.M., Aus.I.M.M., M.I.M.M., C.Eng., Senior Mining Engineer at the Australian Bureau of Mineral Resources, Geology and Geophysics, evaluates the profitability of mining polymetallic nodules from the deep sea-bed in the north-east Pacific Ocean. Two hypothetical operators are considered - an Australian company, assumed to be paying a production charge to the International Sea-Bed Authority (ISA) and the Enterprise (the autonomous mining arm of ISA), assumed not to be paying any charges.

The capital and operating costs for an operation with a capacity of 3 million metric tonnes (Mt) of nodules (dry) per year for a production life of 20 years and a preproduction period of 11 years were estimated from published material. The details of the operation are: (a) two mining ships, each with a hydraulic mining system, (b) three ships for transportation of nodules from the mine site to a port on the west coast of the United States of America, (c) a Cuprion-process plant to extract nickel, copper and cobalt, and (d) an add-on ferromanganese-process plant to concentrate manganese-rich waste from the Cuprion-process and produce ferromanganese.

The cost estimates also include (a) initial and ongoing exploration, (b) research and development of mining and extraction technology and (c) transport of products to market.

The prices of nickel, copper, cobalt and ferromanganese have fallen steadily over the last 10 years in real terms (table 3.6). The demand outlook for the four metals to the end of the century is that the projected small growth will be met by the present spare capacity of land-based producers. The outlook for prices is that no change is expected in real terms apart from nickel, which may increase in the long term. With the present outlook, it was decided to use the average metal price for the month of March 1985 for calculations of revenue. The cost estimates have been made in March 1985 United States dollars.

The profitability of the mining operations has been evaluated by calculating the discounted cash flow rate of return (DCFROR). For such a high-risk venture to be viable, it is considered that a DCFROR of 18 per cent or greater would be required to attract the necessary investment capital. The calculated DCFROR for the Enterprise was less then 1 per cent based on point estimates for costs, unit price and grade. The revenue from the four metals totals $192/tonne of nodules recovered. For a DCFROR of 18 per cent to be reached, the revenue per tonne would have to rise to $366. This would require the aggregate metal prices of the products to double.

Point estimates for costs, unit price and grade give no indication of the uncertainty of the estimate. Thus, for each parameter, a range was estimated in which the actual value was likely to be found. DCFROR calculations were carried out using sample values randomly selected by the Monte Carlo simulation procedure. These calculations were done using the United States Bureau of Mines mine simulation (MINSIM) computer programme.

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The ranges of results, given in table 1 below, provide an indication of the expected DCFROR values. The results show that no forecast DCFROR exceeds 4 per cent, which is well below the target DCFROR of 18 per cent. It is noted from table 1 that the Australian company, paying taxes and production charges to ISA, is less profitable than the Enterprise.

The alternative extraction processes do not improve profitability.

The conclusion is that, given the present metal price outlook, deep sea-bed mining for polymetallic nodules is unlikely to be undertaken on a commercial basis for the foreseeable future.

TABLE 1. DEEP SEA-BED MINING: SUMMARY OF DISCOUNTED CASH FLOW RATES OF RETURN (DCFRORs) FOR THE TWO HYPOTHETICAL OPERATORS

Simulation	Range Upper	 Mean	 Lower
		Percentage	
The Enterprise with full equity	+4	2	-1
The Enterprise with full equity and loan repayments made for equity borrowed	0	-3	-7
The Enterprise with half equity and loan repayments made for half equity borrowed	+4	1	-3
Australian company (before tax)	+2	0	-4
Australian company (after tax)	+1	-1	-5
The Enterprise (with full equity) using the pyrometallurgical process	0	-3	-9
The Australian company (before tax) using the pyrometallurgical process	-4	-14	-40
The Enterprise (with full equity) using the reduction ammonia leach process	+3	0	-3
The Australian company (before tax) using the reduction ammonia leach process	-1	-5	-13

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I. INTRODUCTION

The discovery of polymetallic nodules on the ocean floor has led to research into the development of mining methods and processes for the mining and recovery of nickel, copper, cobalt and manganese from these nodules. To date, no mining on a production scale has started, owing mainly to the adverse market that prevails for these metals.

The Bureau of Mineral Resources, Geology and Geophysics (BMR) undertook this study in order to evaluate the profitability of mining nodules from the deep sea-bed, and to assess the likelihood of any ocean mining in the near future.

After a review of published reports on deep sea-bed mining, it was decided that a hypothetical mining operation with a capacity of 3 million dry tonnes of polymetallic nodules per year (polymetallic nodules in their natural state contain about 30 per cent water by weight) would be considered, for the extraction of nickel, copper and cobalt and manganese in the form of ferromanganese. The area of the ocean floor that is considered to be of highest value in terms of metal grade and nodule abundance is the north-east Pacific Ocean, around 126° west, 15° north, between the Clarion and Clipperton fracture zones. The mining operation would be based on the west coast of the United States of America where the processing plant would be located.

The hypothetical mining venture considered in this study is assumed to be Australian-owned. The venture would be required to pay a production charge to the International Sea-Bed Authority (ISA) and also pay Australian taxes. No charges that would be payable to the United States of America are considered in this study.

It is envisaged that, under the United Nations Convention on the Law of the Sea, the Australian mining venture will be mining alongside the mining arm of ISA, the Enterprise. Thus, the likely profitability of the Enterprise is also considered in detail.

II. COST ESTIMATION

The study was based on published cost estimates. As mentioned, there is no mining of nodules to date and so all the cost estimates are founded on the assumption that satisfactory mining and processing systems will be developed. The costs were escalated to March 1985 United States dollars using published United States indexes (annex I).

2.1 Exploration costs

Detailed exploration of the resource will be required before a decision is taken to build the mining ships, transport ships and process plant. This will require ship charter for a survey by marine geologists to make a detailed evaluation of reserves. The exploration will have to determine (a) the areal variations in the abundance of the nodules, (b) the areal variability of the grade of all four metals and (c) the topography of the mining surface.

The six-year exploration programme of Hillman & Gosling (1985) is used in this

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study and their cost of $21 million (1983 $US) was escalated to $21.1 million. The indexes used for this escalation and their weighting were unskilled labour (25 per cent) (equivalent to mining labour in annex I), skilled labour (20 per cent) (equivalent to construction labour in annex I), fuel (30 per cent) and transport (25 per cent). The calculation for each index was:

$$\frac{\text{March 1985 index}}{1/2\ (\text{average 1982 index} + \text{average 1983 index})} \quad \frac{}{\text{x percentage}}$$

The Enterprise is assumed to carry out all its own exploration. (It is noted that the Enterprise can request registered pioneer investors to carry out the exploration on its behalf under the United Nations Convention on the Law of the Sea, resolution II, paragraph 12 (a) (i).)

2.2 Mining costs

The size of the operation was fixed at 3 million dry tonnes of polymetallic nodules per year as several authors (Shaw, 1976; Nyhart, 1983; Flipse, 1982; Hillman, 1983, and Hillman and Gosling, 1985) used this capacity of operation to do their economic evaluations of deep sea-bed mining. No other size of operation was considered in this study.

The mining operation is carried out by a collector that progresses along the ocean floor. The collector has the capability to discharge some of the fine sediment collected with the nodules. The collector is connected to the mining ship by a pipe through which the nodules are pumped to the surface in a slurry. The mining ship has further screening facilities to remove any remaining fines before the nodules are stored in the ship. The mine ship is designed with a storage capacity the same as that of the ships that transport the nodules to the port.

Two mining ships will be required. Each will work 300 days per year (allowing 40 days for maintenance and unsuitable weather), and 20 hours' production time per day (Hillman, 1983), at 94 per cent efficiency. This gives an overall utilization of the mining system of 78 per cent; this may be high, but Andrews and others (1983) and Hillman (1983) consider it can be achieved. The collector has the same characteristics as that used in the study by Hillman (1983). A 10 m collector working at 90 per cent dredge efficiency (the ratio of the quantity of nodules recovered by a collecting device to the quantity of nodules available in the dredge path; Pasho, 1979) is considered, travelling at 1 m/s. At an average abundance of nodules of 8.2 kg/m^2,* the average production will be 266 t/hour.

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* This abundance was used by Hillman (1983). The figure was reached by averaging all the abundance figures obtained from samples. The pumping capacity used for the hydraulic lift will limit the flow rate to 648 t/hour, which equates to an abundance of 18 kg/m^2. This means that all abundances over this figure may have to be reduced to 18 kg/m^2 for calculation of average abundance as the mining system may not handle greater abundances. Andrews and others (1983) mention that the collector will be designed to allow for variations in abundance by having storage capacity, but this would only allow for variations over short distances.

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The parameters of the mining field (i.e. abundance and metal grades) are detailed under Revenue (3.1).

The mine ships will have the capacity to store nine days' production, i.e. about 70,000 t; they will be of the 100,000 dead weight ton (d.w.t.) class, with modifications to allow for mining as detailed in the cost estimates below.

2.2.1 Capital costs

The costs are estimated for one mine ship and doubled for the two ships:

1. Mine ships

(a) Basic ship. The basic ship of 100,000 d.w.t. class is estimated to cost $24.5 million from Japanese shipyards (Department of Transport, personal communication, 1985).

Items (b) to (e) are taken from Flipse (1982) and escalated to March 1985 $US by indexes mentioned in the text.

(b) Hull modifications. The cost of $5.2 million (1980 $US) was escalated for skilled labour (50 per cent) and steel 950 per cent) indexes, giving $6.6 million. This allows for several modifications including a moon pool to enable the collector and pipes to be lowered from the centre of the ship, where there is least effect by wave motion.

(c) Machinery modifications. The cost of $8.4 million (1980 $US) was escalated for skilled labour (60 per cent), steel (20 per cent) and equipment (20 per cent) indexes. This gives a cost of $11.5 million.

(d) Navigation and communications. The cost of $0.9 million (1980 $US) was escalated to $1.1 million for extra equipment (equipment index 100 per cent), required so that the ship can accurately steer the collector through the mining area.

(e) Special hotel and shops. The cost of these items, of $2 million and $1.4 million respectively (1980 $US), was escalated for skilled labour (50 per cent), equipment (25 per cent) and steel (25 per cent) indexes. These items are required for the mining crews and ship crews who will be required to be on board the mine ships for a 30-day stretch before relief. The escalated cost is $2.6 million and $1.8 million for the hotel and shops respectively.

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		$ million
(a)	Basic mine ship	24.5
(b)	Hull modifications	6.6
(c)	Machinery modifications	11.5
(d)	Navigation and communications	1.1
(e)	Special hotel	2.6
	Shops	1.8
	Total	48.1 x 2 = 96.2

2. Handling and storage facilities for the mining and ore handling equipment

The handling and storage facilities include a derrick to raise and lower the 4,000-5,000 m of pipe and storage for all the pipe on board ship. A spare collector is also required to be stored. The ore handling system consists of:
(a) equipment to transfer the nodule slurry from the vertical pipe to a separator where sea water is returned to the sea and the nodules put on to a conveyor;
(b) the conveyor system, which transfers the nodules to the storage; and
(c) equipment for the reclaiming and transfer of nodules on to the transport ships in slurry form. The fuel transfer equipment from the transport ship to the mining ship is included in this cost. Hillman and Gosling (1985) estimate the cost of this equipment as $87.1 million (1983 $US) for the two ships. This is escalated for skilled labour (65 per cent) and steel (35 per cent) indexes, to give a cost of $93.5 million.

3. Pumping system

The pumping system would include multi-stage submersible pumps supplied with electricity from a cable alongside the pipe. The cost of these pump systems was estimated by Flipse (1982) and Andrews and others (1983) as $11.8 million in 1980 $US and $13.8 million in 1982 $US. Hillman (1983) estimated the cost of $13 million in 1981 $US and Hillman and Gosling (1985) estimated $14.85 million in 1983 $US. The rate of increase of these costs is more in line with the United States consumer price index (CPI) than with any other index, and so CPI was used to escalate the estimate of Hillman and Gosling (1985) to $16.15 million for each mining ship, i.e. $32.3 million for both.

4. Dredge pipes and bottom hoses

The dredge pipe is required to be in manageable lengths of about 12-13 m, with an internal diameter of about 40 cm, Hillman (1983). The pipes would be painted outside with inorganic zinc and coated inside with an abrasion-resistant material (Flipse, 1982). The pipes would have stand-offs to allow the electric cables to be

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attached. There would be special sections for mounting the pumps. Each ship would have one set of dredge pipes, while a third would be stored at the base port. It is mentioned by Flipse (1982) that any major damage or loss of the pipe string would cause other damage, requiring a return to the base port for repairs. The estimate of Flipse (1982) of \$13.4 million (1980 \$US) for each string was escalated for steel (60 per cent) and skilled labour (40 per cent) indexes, giving a cost of \$16.7 million. The flexible hose at the bottom of the string, which connects to the collector, is estimated by Flipse (1982) to cost \$1.4 million (1980 \$US). This is escalated for industrial materials (80 per cent) and skilled labour (20 per cent) indexes to give \$1.7 million. For the two ships, the total cost equals (16.7 x 3) + (1.7 x 4) = \$56.9 million.

5. Collector

The collector, as mentioned, is required to reject large boulders but accept nodules and sediment. However, the fine sediments are removed before the nodules are transported to the mine ship, to reduce the total material pumped. The collector has to be designed to rest on the sediments, which have average vane shear strengths of 20 g/cm^2 at the sediment surface to 100 g/cm^2 at 15 cm depth (Hillman, 1983). The collector is required to maintain very high levels of availability, as it is estimated by Hillman (1983) to take between four and five days to lower the collector to the ocean floor.

The cost estimates for the collector by Flipse (1982), Andrews and others (1983), Hillman (1983) and Hillman and Gosling (1985) are similar if it is assumed that Hillman's estimate includes a spare collector for each ship for the \$7.5 million. There is an approximate increase in cost of \$0.5 million per year from the Flipse (1982) estimate to that of Hillman and Gosling (1985). The cost estimate for two collectors for each ship is thus \$8.5 million.

6. Start-up costs

These costs are based on the requirement that modifications to steelwork will be necessary in the early stages of mining. The estimate of Hillman and Gosling (1985) of \$23.2 million (1983 \$US) was escalated for skilled labour (50 per cent), steel (30 per cent), unskilled labour (10 per cent) and equipment (10 per cent) indexes, to derive a figure of \$24.8 million.

Total mine capital costs	\$ million
2 mine ships	96.2
Handling and storage/ore handling	93.5
Pumping system	32.3
3 pipe systems, 4 hoses	56.9
Collectors (including spares)	8.5
	287.4
Start-up costs	24.8
Total	312.2

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It is assumed that the costs will be equally distributed over the six years of construction and that the start-up costs are added to the sixth year. This gives $47.9 million per year for the first five years, and $72.7 million for the sixth year.

2.2.2 Annual operating costs

1. Crew costs

Each ship's crew is expected to number 40 and each mining crew 32. The crews are required to have relief, and so two ship's crews and two mining crews are needed for each ship. The cost estimate of Hillman and Gosling (1985) of $21.3 million was escalated with the unskilled labour index to $22.8 million.

2. Subsistence

This provides for food and miscellaneous supplies for the crews on the two mining ships. The Hillman and Gosling (1985) figure of $2 million was escalated, using CPI, to $2.2 million.

3. Maintenance and repairs

These expenses are based on a percentage of the capital costs.

(a) Mining ship. Estimated as 2 per cent of the capital cost (Flipse, 1982).

(b) Pipestring and collector. Hillman (1983) uses the estimate of Shaw (1976), that a 6- to 12-month life for the collector and pipestring can be expected, whereas Flipse (1982) estimates twice this. For this estimate a hypothetical pipestring life of 18 months is used to allow enough funds for repairs/replacement. This gives an annual repair bill of 66 per cent of the capital cost of two pipestrings and two collectors with hoses. (It is noted that a pipestring life of 18 months is impractical, because replacement will require the mine ship to return to port at different times of the year.)

(c) Other mining and transfer gear. Estimated as 5 per cent of capital cost (Flipse, 1982).

Thus, annual cost of maintenance and repairs is as follows:

			$ million
(a)	2% x 96.2	=	1.9
(b)	66% x 41.05	=	27.3
(c)	5% x 125.8	=	6.4
	Total		35.6

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4. Insurance

This is based on the estimate by Hillman and Gosling (1985) of $6 million (1983 $US) and escalated using the CPI to give $6.5 million.

5. Fuel

It is estimated by Flipse (1982) that 46,600 long tons (47,350 t) of fuel oil would be used by the two mining ships each year; Hillman (1983) estimates 51,000 t. For this estimate, 50,000 t is used, at a cost of $190/t. This gives $9.5 million.

6. Lubrication

This is estimated as $0.1 million in line with Flipse (1982) and Hillman (1983) (escalation can be disregarded for this small amount).

7. Exploration and research and development

The continuing exploration of the mining site is considered as a mine operating cost. This work is necessary in evaluating the mining area for the year ahead so that mining plans can be made. A chartered ship would be used in collecting the samples of the ocean bottom and mapping the topography. As the collector is such an essential item of the mining operation, it is imperative that research and development proceeds on the collector and the other mining operations. The estimate by Hillman and Gosling (1985) of $6.4 million was escalated for unskilled labour (25 per cent), skilled labour (20 per cent), fuel (30 per cent) and transport (25 per cent) indexes, but this does not escalate the cost significantly and so $6.4 million is used.

8. General administration

For the Australian company this is estimated to be 5.5 per cent of the operating cost, i.e., $4.6 million. For the Enterprise it is estimated as 10 per cent (i.e. $8.3 million), on the basis that the Enterprise will be putting emphasis on training and will need to establish a personnel section etc., whereas the Australian company will already have a personnel section etc. that can be enlarged at a lower cost than for setting up a new section.

9. Environmental costs

It will be necessary to monitor the plumes put out by the mining ship and by the collector. In this paper it is assumed that this monitoring of the environment (biological, chemical, geological and physical) will start with the production phase. However, it may be necessary to start monitoring before production if the mine operators are to provide an Environmental Impact Statement prior to being given permission to start mining. At present, there are no regulations under the law of the sea Convention stating the legal obligations of mine operators. The equipment required for this monitoring is purchased under capital expenditure (see section 2.5.2 on environmental capital costs), but the operation of retrieving the

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monitoring instruments each year and placing new sets on site is covered here. The monitoring will include the charter of a research vessel for retrieving and placing monitoring devices, on-hand analysis and report writing. Andrews and others (1983) cover this subject in detail and estimate the monitoring to cost $1.5 million per year (1980 $US). This is escalated by the skilled labour index to $1.7 million.

Total annual mine operating costs		$ million
1.	Crew costs	22.8
2.	Subsistence	2.2
3.	Maintenance and repair	35.6
4.	Insurance	6.5
5.	Fuel	9.5
6.	Lubrication	0.1
7.	Exploration and research and development a/	6.4
	Subtotal	83.1
8.	General administration (Australian company)	4.6
9.	Environmental monitoring	1.7
	Total	89.4
8.	General administration (the Enterprise)	8.3
9.	Environmental monitoring	1.7
	Total	93.1

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a/ The cost of this item will be zero in the last year of production.

This is equivalent to $29.8/t of nodules (dry) for the Australian company and $31.03/t for the Enterprise.

2.3 Transportation costs

The transport of nodules from the two mining ships to the west coast of the United States will be by three bulk/ore carriers of the 70,000 d.w.t. class. The various details for the ships are similar to those used by Hillman (1983):

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Transport distance		3410 km
Speed:	Laden	27.0 km/h
	Unladen	31.0 km/h
Cycle time:	Laden to port	5 days 6 hours
	Unladen from port	4 days 14 hours
	Port	1 day 21 hours
	Loading at sea	1 day 8 hours
	Total	13 days 1 hour
Load per trip (90% capacity)		64 000 t (wet)
Production a/		300 days/year
Trips per vessel per annum		23
Total number of ships		3
Crew size		28
Fuel and lubrication consumption:		
	At sea	39 t fuel oil/day 3 t diesel oil/day
	At port	one-tenth "at sea" consumption

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a/ The mining ships are assumed to have a realistic production capability of 300 days for the year. With a storage capacity equivalent to approximately 9 days production on each mining ship, transportation would be required on less than 300 days, but there may be problems with scheduling the three transport ships with the two mining ships. For this study, 23 round trips per vessel have been assumed, which allows for some flexibility. It is noted that the loading time of the ship at sea could be reduced by improved techniques and more slurry lines between the mining ship and the transport ship. This would allow more time in port.

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2.3.1 Capital costs

1. Three 70,000 d.w.t. bulk/ore transport ships

These are assumed to be built in Japanese shipyards, where a 70,000 d.w.t. class bulk/ore ship cost $17.5 million in September 1984 (source: Lloyd's Shipping Economist). The current price trend is downwards ($16 million in December 1984, same source). The estimate for this study is taken as $17.5 million per ship, i.e. $52.5 million for the three transport ships.

2. Slurry handling system

Each transport ship will be required to have equipment that can pump the slurry from the mining ships. Dewatering pumps will also be required to drain the holds of the transport ships once the slurry is placed. The transport ships will not need to re-slurry and unload the nodules; this will be done by re-slurrying and pumping-out equipment at the slurry terminal port. Andrews (1978) estimated that the slurry loading and dewatering equipment for each ship would cost $1.22 million (1977 $US). This cost is escalated for the same indexes as the ore handling equipment on the mine ship, i.e., for skilled labour (65 per cent) and for steel (35 per cent). This gives a cost for the three ships of $2.04 million x 3 = $6.1 million.

3. Upgrading of transport ship

There will be special, additional, facilities on the transport ships, such as extra berths for the relief crews of the mining ships. The cost estimated by Andrews (1978) of $5 million allowed for "oriental diesel" ships to be upgraded to pass United States requirements. However, this cost may be too high, because the standard ship from a Japanese shipyard may already meet several of the requirements. The cost estimate of $5 million is escalated for skilled labour (50 per cent), steel (30 per cent) and equipment (20 per cent) indexes to $8.43 million for each ship. Total $25.3 million.

4. Supply boat

A long-range, high-speed boat is allowed for in the estimate, to take supplies to the mining ships. Hillman (1983) estimates the cost of the boat to be $1.4 million (1981 $US) and Hillman and Gosling (1985) $1.5 million (1983 $US). It is estimated to be $1.6 million for this study.

Total transport capital cost	$ million
1. Three 70,000 d.w.t. ships	52.5
2. Three slurry handling systems	6.1
3. Upgrading of transport ship	25.3
4. Supply boat	1.6
Total	85.5

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It is assumed that the construction of the three ships will take six years and the construction of the supply boat the last two years of the six-year period.

2.3.2 Annual operating costs

1. Wages and benefits

The cost estimate by Hillman and Gosling (1985) of $4.7 million (1983 $US) was for a United States crew of 32. Australian crew costs are similar. The cost of $4.7 million was escalated by the unskilled labour index to $5 million.

For items 2 to 4 and 7 and 8 below, the Hillman and Gosling (1985) estimates in 1983 United States dollars were used for this study and escalated by the various indexes mentioned.

2. Subsistence

The estimate of $0.5 million for food and supplies was escalated with CPI but this produced an insignificant increase and so $0.5 million was used.

3. Maintenance and repairs

The estimate for ship maintenance and repairs of $6.2 million was escalated by the skilled labour (50 per cent), equipment and parts (30 per cent) and steel (20 per cent) indexes, to give $6.6 million.

4. Insurance

The estimate of $1.4 million for the insurance of the three transport ships and the supply boat was escalated using the CPI (100 per cent) to $1.5 million.

5. Fuel and lubrication

The fuel consumption rate used, as detailed above, was 39 t of fuel oil and 3 t of diesel oil per day at sea and one-tenth of the "at sea" consumption in port. For the 23 trips of the 3 ships at a cost of $190/t for fuel oil and $300/t for diesel oil, this gives a cost of $6.5 million.

6. Port charges

The average port charge of $20,000 per visit, as supplied by the Department of Transport (1985), was used. The total estimate for the year is $1.3 million.

7. Helicopter

The cost of leasing and operating a helicopter was estimated at $0.7 million and escalated to $0.8 million.

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8. Supply boat

The operation of this boat with crew, fuel and supplies was estimated to be $1.8 million. This was escalated by the unskilled labour (50 per cent), equipment (30 per cent) and fuel (15 per cent) indexes to $1.9 million.

9. General administration

The same percentages of operating costs were taken as in the mining overhead costs, i.e., 5.5 per cent for the Australian company, and 10 per cent for the Enterprise of operating costs ($1.3 million and $2.4 million respectively).

Total transport operating costs	$ million
1. Wages and benefits	5.0
2. Subsistence	0.5
3. Maintenance and repairs	6.6
4. Insurance	1.5
5. Fuel and lubrication	6.5
6. Port charges	1.3
7. Helicopter	0.8
8. Supply boat	0.9
Subtotal	24.1
9. General administration (Australian company)	1.3
Total	25.4
9. General administration (the Enterprise)	2.4
Total	26.5

This is equivalent to $8.47/t of nodules (dry) transported for the Australian company and $8.83/t for the Enterprise.

2.4 Processing and other land-based costs

The composition of polymetallic nodules is such that the contained copper, nickel or cobalt cannot be liberated simply by physical beneficiation. This is because the metals do not occur in the usual ore minerals, but are disseminated in the manganese and iron oxides that make up most of each nodule. The porosity of the nodules is high, with a surface area of 200 m^2/g (King and Pasho, 1979), leading to a water content of about 30 per cent by weight.

The process considered in this study is the Cuprion process, developed by Kennecott Copper Corporation, as detailed by Hillman (1983). The Cuprion process and others that have been developed to date are listed in table 2.1 and the processes not fully developed in table 2.2.

The Cuprion hydrometallurgical process uses an ammoniacal solution containing cuprous ions to extract copper, nickel and cobalt from the manganese and iron oxides. The copper and nickel are recovered from the solution by ion exchange and electrowinning to produce copper and nickel cathodes. The cobalt is recovered from the solution by precipitation with hydrogen sulphide. The cobalt is then washed, dried and sold as a powder; the ammonia is recovered from solution and recycled (figure 2.1). For the four-metal recovery, an add-on manganese recovery plant is assumed that produces ferromanganese. The carbonate tailing from the leach process would be put through flotation cells with additives; then put through a kiln to give a synthetic manganese oxide ore of 55-60 per cent manganese. The ore would then be put in a furnace with fluxes and iron ore to give a ferromanganese product containing 78 per cent manganese.

The recoveries assumed for the four metals are based on Hillman (1983) as the add-on ferromanganese plant and Cuprion method are considered in his study (table 2.3).

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TABLE 2.1. CONVENTIONAL PROCESSING TECHNOLOGIES*

Process	State of development
Reduction ammonia leach process	Equivalent module
Cuprion process	Pilot plant
Pyrometallurgical process	Equivalent module
Hydrochloric acid leach process	Pilot plant
Sulfuric acid leach process	Pilot plant

Source: Arthur D. Little, Inc.

* Conventional processes are defined as those that have either undergone significant bench-scale and pilot-plant testing or are based on a process currently in operation. For instance, the reduction ammonia leach process is based on the Nicaro process developed for lateritic ores. Thus, it has an equivalent industrial module.

TABLE 2.2. OTHER PROCESS OPTIONS

Process type	Source a/	Patent assignee(s)	State of development b/	Process concept c/
SO_2 process (sulfurous acid)	Literature (10)	Bur. Mines/Univ. of Hawaii	Lab	Flowsheet developed
Nitrous/nitric acid	Literature (2)	Chemetals, Inc.	Lab	Flowsheet developed
Oxalic acid	Literature (2)	Univ. of Hawaii Univ. of Arizona	Lab	Inferred
Adsorbing colloidal flotation	Literature (2)	Univ. of Hawaii Univ. of Arizona	Lab	Inferred
Plasma technology	Literature (1)	Not assigned	Conceptual	Inferred

Source: Arthur D. Little, Inc.

a/ Figures in parentheses stand for the number of post-1977 references indicated.

b/ Lab = Laboratory/bench-scale tests.

c/ The overall process concept and flowsheet can be either developed from literature or inferred from similar processes and technologies.

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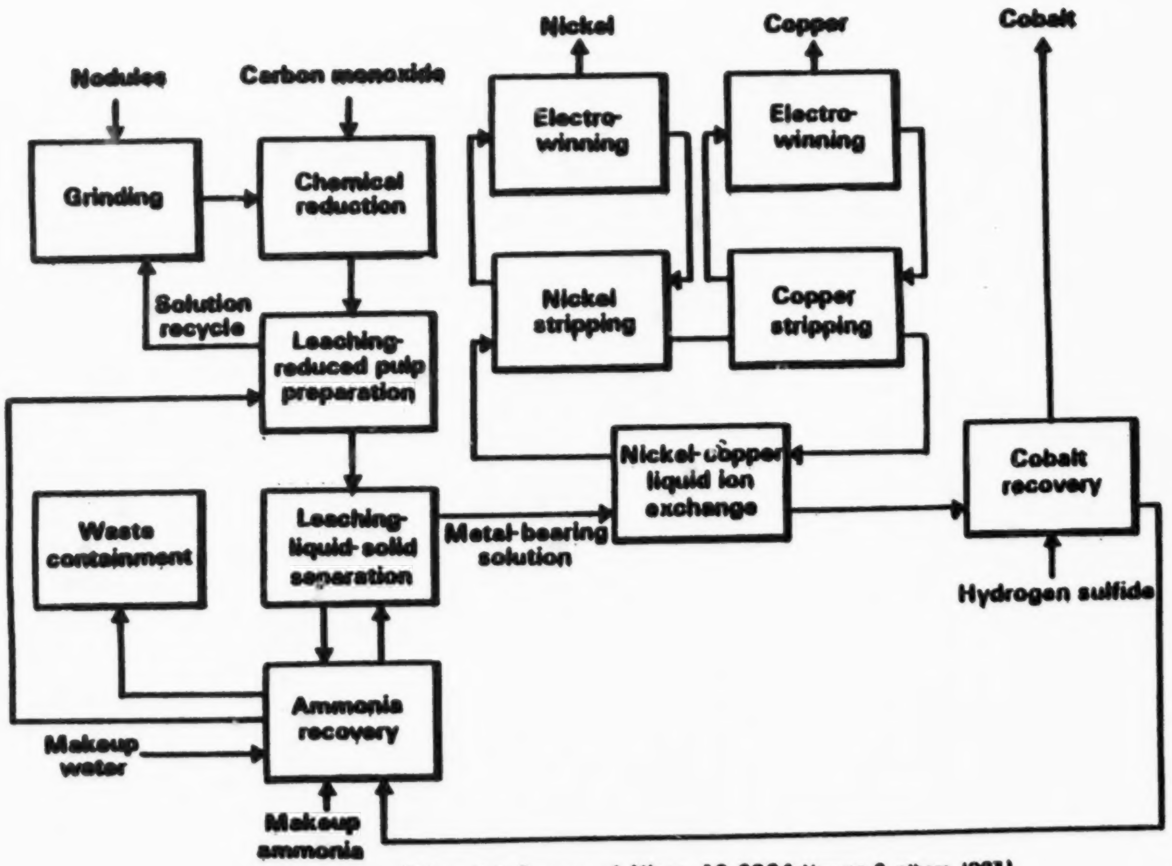
Nodules
Carbon monoxide
Grinding
Chemical reduction
Solution recycle
Leaching-reduced pulp preparation
Leaching-liquid-solid separation
Waste containment
Ammonia recovery
Makeup water
Makeup ammonia
Metal-bearing solution
Nickel
Copper
Cobalt
Electro-winning
Electro-winning
Nickel stripping
Copper stripping
Nickel-copper liquid ion exchange
Cobalt recovery
Hydrogen sulfide

(After U.S. Bureau of Mines, IC 8924, Haynes & others, 1983)

Fig. 2.1 CUPRION PROCESS

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TABLE 2.3. METAL RECOVERIES IN CUPRION/FERROMANGANESE PROCESSING

	Recovery (%)
Cobalt	65
Copper	92
Manganese	44
Nickel	92

2.4.1 Capital costs

The cost estimate of the Cuprion plant, "add-on" ferromanganese plant, slurry terminal and slurry pipeline is based on the Hillman and Gosling (1985) estimate and has been escalated from January 1983 United States dollars to March 1985 United States dollars, with various indexes mentioned. The only variations to the cost estimate of Hillman and Gosling (1985) are (a) the capital-related expenses for the operating cost estimates (i.e. maintenance, materials and insurance) which are based on a percentage of total capital expenditure from Flipse (1982) and (b) the general expenses for the Enterprise which is 10 per cent as for the other sections. No allowance has been made for possible additional capital costs related to infrastructure and town site. It is assumed that these are already available at the site of the process plant.

2.4.1.1 Cuprion process plant

1. Plant and equipment

The cost estimate for construction of the plant plus purchase of equipment was $370.3 million. This is escalated for skilled labour (40 per cent), construction material (40 per cent) and steel (20 per cent) indexes to $394.5 million.

2. Utilities and services

The cost estimate of $159.1 million for construction of the utilities and services was escalated for purchased equipment (70 per cent), skilled labour (17 per cent) and construction materials (13 per cent) indexes to $167.0 million. This includes the construction of a coal-fired power generation unit for the Cuprion plant, the exhaust gases being used in the process (carbon monoxide, carbon dioxide).

3. Waste disposal (dams etc.)

The cost estimate of $30.3 million for construction of waste disposal dams was escalated for skilled labour (58 per cent), fuel (25 per cent), tyres (15 per cent) and construction materials (2 per cent) indexes to $30.5 million. (These escalation factors were taken from the Capital and Operating Cost Estimating System Handbook (Mathews, 1977), on earth-fill dikes and small-dam construction.)

4. Waste disposal (pipelines etc.)

The cost estimate of $20.9 million for the construction of waste disposal pipelines, pumps, etc. and land acquisition for disposal area was escalated to $22.3 million. Land acquisition was assumed to be 10 per cent of the capital cost and was escalated using CPI. The remainder was escalated for purchased equipment (56 per cent), steel (28 per cent) and skilled labour (16 per cent) indexes.

5. Railway spur and access road

The cost estimate of $5.7 million for building the railway spur and access road, each 8 km long, was escalated for steel (29 per cent), construction materials (20 per cent), skilled labour (20 per cent), timber (20 per cent), fuel (6 per cent) and tyres (5 per cent) indexes to $5.9 million.

6. Land acquisition

The cost estimate of $2.6 million for land acquisition for the plant was escalated with CPI to $3.2 million.

Total capital cost for Cuprion plant	$ million
1. Plant and equipment	394.5
2. Utilities and services	167.0
3. Waste disposal (dams etc.)	30.5
4. Waste disposal (pipelines, etc.)	22.3
5. Railway spur and access road	5.9
6. Land acquisition	3.2
Total	623.4

2.4.1.2 Ferromanganese plant

1. Plant and equipment

The cost estimate of $129.6 million for the ferromanganese plant, including flotation cells, kiln and electric furnace, was escalated by the same indexes as for plant and equipment for the Cuprion process plant, to $138.1 million.

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2. Utilities and services

It is assumed that the power for this plant is purchased from a nearby power station. The cost estimate of $31.1 million includes the water supply, power reticulation and other service connections. It was escalated by the same indexes as for the same item in the Cuprion plant to $32.6 million.

Total capital cost for ferromanganese plant	$ million
1. Plant and equipment	138.1
2. Utilities and services	32.6
Total	170.7

2.4.1.3 Slurry terminal

A facility will be needed for re-slurrying and unloading the nodules at the slurry terminal port, together with adequate storage prior to pumping to the process plant. The transport ships would also take on supplies; but it is assumed that fuel bunkering would be done from a barge and no fuel storage facilities would be required at the terminal. The cost estimate of $40.8 million was escalated for skilled labour (40 per cent), construction materials (30 per cent) and equipment (20 per cent) indexes and for CPI (10 per cent) to $44.2 million.

2.4.1.4 Slurry pipeline

This item includes the purchase of land between the terminal at the coast and the process plant, assumed to be 40 km away, and the slurry pipelines with pump stations. The cost estimate of $20.7 million was escalated for steel (40 per cent), skilled labour (30 per cent), equipment (20 per cent), construction materials (5 per cent) indexes and for CPI (5 per cent) to $22.1 million.

Total capital cost for all land-based items	$ million
2.4.1.1 Cuprion process	623.4
2.4.1.2 Ferromanganese plant	170.7
2.4.1.3 Slurry terminal	44.2
2.4.1.4 Slurry pipeline	22.1
Total	860.4

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2.4.2 Annual operating costs

2.4.2.1 Cuprion plant, slurry terminal and slurry pipeline

1. Wages and benefits

The cost estimate of $18.6 million for the wages and benefits of operators of the Cuprion plant is escalated for the unskilled labour index (100 per cent) to $19.9 million.

2. Materials and supplies

The cost estimate of $4.0 million for the process materials and supplies such as chemicals and reagents is escalated for the industrial materials index (100 per cent) to $4.1 million.

3. Utilities and fuel

The cost estimate of $40.5 million for utilities and fuel, such as coal, petroleum and water, is not escalated, because the costs of these items have not risen appreciably over the last two years.

4. Capital-related expenses

The cost estimate for the maintenance of the Cuprion plant, slurry terminal and slurry pipeline is taken as 4 per cent of the total fixed capital (TFC) and for supplies as 1 per cent of TFC. Insurance of these is also taken as 1 per cent of TFC. The capital cost of the plant, slurry terminal and slurry pipeline is $689.7 million, and so capital-related expenses are $41.4 million (6 per cent of $689.7 million).

5. Waste disposal

Cost estimate of $7.8 million escalated for unskilled labour (40 per cent), construction materials (20 per cent), equipment (15 per cent), steel (15 per cent), tyres (5 per cent), and fuel (5 per cent) indexes to $8.1 million.

6. Pipeline to waste disposal

The cost estimate of $2.7 million for the maintenance, operating and repair of the pipeline from the process plant to the waste disposal site is escalated for skilled labour (60 per cent) and equipment (40 per cent) indexes to $2.9 million.

7. Slurry pipeline

The cost estimate of $6.5 million for the maintenance, operating and repair of the 40 km pipeline from the port terminal to the processing plant, is escalated for the same indexes as item 6, to $6.9 million.

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8. Unload and store

The cost estimate of $3.1 million for the unloading and storing of nodules at the port terminal, including maintenance and repair, is escalated for the same indexes as the item 6, to $3.3 million.

9. Rail spur

The cost estimate of $0.2 million for the maintenance and operation of the rail spur is not escalated.

10. General administration

The overhead cost for administration is based on a percentage of operating costs. For the Australian company, the percentage is taken as 5 per cent and for the Enterprise as 10 per cent (the same for the overheads for transport and mining).

11. Research and development

Improvements to the process will be continually necessary, to keep the operation economically viable. The cost is estimated as $2 million. The work can be done in-house or contracted out.

Total annual operating cost for Cuprion plant, slurry terminal and slurry pipeline

		$ million
1.	Wages and benefits	19.9
2.	Materials and supplies	4.1
3.	Utilities and fuel	40.5
4.	Capital-related expenses	41.4
5.	Waste disposal	8.1
6.	Pipeline to waste disposal	2.9
7.	Slurry pipeline	6.9
8.	Unload and store	3.3
9.	Rail spur	0.2
	Subtotal	127.3
10.	General administration (Australian company)	6.4
11.	Research and development	2.0
	Total	135.7
10.	General administration (the Enterprise)	12.7
11.	Research and development	2.0
	Total	142.0

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This is equivalent to $45.2/t of nodules (dry) processed for the Australian company and $47.3/t of nodules (dry) processed for the Enterprise.

2.4.2.2 Ferromanganese plant

1. Wages and benefits

Cost estimate, $32 million, escalated for unskilled labour (100 per cent) to $34.2 million.

2. Materials and supplies

Cost estimate, $43.6 million, escalated for industrial materials (100 per cent) to $44.8 million.

3. Utilities and fuel

Cost estimate $118.6 million for coal, power and water. Not escalated, owing to very small changes in these commodities. Power is purchased off the local electric grid.

4. Capital-related expenses

Cost estimate, $10.2 million, based on 6 per cent of the capital expenditure, as with the other land-based plant and equipment.

5. General administration

Cost estimate as in analogous previous sections, i.e. 5 per cent of total operating costs for the Australian company and 10 per cent of total operating costs for the Enterprise.

Total ferromanganese plant annual operating costs

	$ million
1. Wages and benefits	34.2
2. Materials and supplies	44.8
3. Utilities and fuel	118.6
4. Capital-related expenses	10.2
Subtotal	207.8
5. General administration (Australian company)	10.4
Total	218.2
5. General administration (the Enterprise)	20.8
Total	228.6

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This is equivalent to $72.7/t of nodules (dry) processed for the Australian company and $76.2/t of nodules (dry) processed for the Enterprise.

2.5 Research and development and environmental capital costs

2.5.1 Research and development capital costs

Research and development of the mining and processing operations must precede the major investment in construction. The mining operation requires development of a low-maintenance highly efficient collector and pumping system, and the processing of the nodules requires the research and development of a process from work-bench to pilot-plant stage. These costs will be capitalized, and are separate from the ongoing research and development which are allocated to operating costs because expenditure commences after the start of operations.

1. Mining research and development capital costs

These have been estimated by Hillman and Gosling (1985) as $75.3 million (1983 $US) over a seven-year programme. For this study the figure is escalated for unskilled labour (30 per cent), skilled labour (30 per cent), equipment (20 per cent), and steel (20 per cent) indexes, to $80.2 million.

2. Processing research and development capital costs

The Hillman and Gosling (1985) estimate of $82.5 million is used and escalated for skilled labour (30 per cent), steel (25 per cent), unskilled labour (20 per cent), industrial commodities (15 per cent) and construction materials (10 per cent) indexes to $87.6 million. The programme is over seven years.

The total research and development cost is thus $167.8 million over seven years. Half of this amount is assumed to be expended over the first five years ($16.78 million/year) and the other half over the last two years ($41.95 million/year).

2.5.2 Environmental capital costs

The equipment required to monitor and survey the mining area is estimated by Flipse (1984) to be $3 million. Escalated using the Equipment and Parts Index gives a cost of $3.2 million (March 1985 $US). These equipment costs are expended before the first year of production and are allocated to capital. The operating costs of the environmental surveys, using these instruments, are included within the mine operating costs (section 2.2.2).

2.6 Working capital costs

The working capital required for the start of the production is assumed to be 125 per cent of annual mine operating costs, 125 per cent of annual transport operating costs and 50 per cent of annual process operating costs. The percentage figures for mine and transport are based on Hillman (1983) and the figure for processing is from Hillman and Gosling (1985). Thus, the total working capital

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required for the Australian company is $320.5 million and for the Enterprise $334.6 million. In the cash flow analysis, the working capital is recovered in the last year through reduced operating costs.

2.7 Transport cost to market

It is assumed in this study that there will be a sufficient market for copper on the west coast of the United States to absorb the production, without significant transport costs. It is assumed that the other three commodities will need to be transported to warehouses in the eastern United States. The cost is calculated using the Capital & Operating Cost Estimating System Handbook (Mathews, 1977). The calculations are for transporting ore only, but it has been assumed that the transport costs for the final products will be of the same order. The average cost of all minerals quoted was used and costs indexed by the transport index.

$$\text{Cost/t/km} = 2.307 \times \text{factor}$$
$$\text{Factor} = 5.361\ (\text{dist. km})^{-0.3646}$$

A distance of 3,000 km is assumed from the west coast site to the market warehouse.

$$\text{Factor} = 5.361 \times 3000^{-0.3646} = 0.289$$
$$\text{Cost/t} = 2.307 \times 0.289 \times 3000 = \$20.01$$

This is escalated to March 1985 dollars. Cost/t = $20.01 x 2.318 = $46.39
= $46

This estimate only covers the transport cost of product to market. A typical mining company has other costs under the category of marketing and sales, which have not been included in this study.

III. REVENUE ESTIMATION

3.1 Metal grade

The metal grades of the four metals to be recovered are taken from the Hillman (1983) study (table 3.1). The grades are for the "CI" area, as identified by Hillman, which is at approximately 126°W and 15°N. The grades are determined by averaging all the samples taken. There is still much uncertainty as to whether the variations in grade of the metals in the nodules are random or inversely related to the abundance of the nodules. It is assumed in this study that the grades vary randomly.

3.2 Product

With the grades of metal given above, and the metal recovery factors (see table 2.3), the amount of metal product recovered from the 3 Mt nodules (dry)/year is as given in table 3.2 below.

3.3 Metals outlook

3.3.1 Cobalt

Current world cobalt production for 1984 is estimated as 29,100 t (table 3.3). Thus, production from an operation of 3 Mt of dry nodules, at 5,070 t, would be equivalent to 17 per cent of world production. Cobalt consumption in the United States for 1984, where the nodule processing plant is sited, is estimated as 8,410 t; thus nodule production of cobalt would be equivalent to 50 per cent of United States demand. The effect of this tonnage of cobalt on the United States and world markets must be considerable.

The forecast world demand in the year 2000 (excluding the United States) is in the range 22,700-32,700 t compared to 14,300 t in 1983 (Kirk, 1985). The forecast demand for the United States is in the range from 10,900-20,000 t in 2,000 compared to 7,100 t in 1983. These growth rates of demand average 3.5 per cent for the world and 3.9 per cent for the United States over the next 15 years.

TABLE 3.1. METAL GRADES OF POLYMETALLIC NODULES USED IN THIS STUDY

Metal	Grade (%)
Cobalt (Co)	0.26
Copper (Cu)	1.03
Manganese (Mn)	26.80
Nickel (Ni)	1.33

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TABLE 3.2. METAL PRODUCT FROM 3 Mt OF NODULES (DRY)

Metal product	Tonnes
Cobalt	5 070
Copper (Cu)	28 704
Ferromanganese (78%Mn)	453 538
Nickel	36 720

With the possibility of cobalt being substituted by other metals in alloy manufacture (albeit at a poorer performance), the price is not likely to advance any further in real terms.

Over the last year the price has remained static, and long-term price stability is expected. Any increase in demand is anticipated to be met by current capacity with little change in price.

3.3.2 Copper

Estimated world mine production of copper for 1984 was 8,274,000 t (table 3.4). The production from a 3 Mt dry-nodules per-year operation would produce 28,700 t of copper, which is 0.35 per cent of world production. This tonnage is not significant compared to the tonnages of the other metals produced in relation to world production.

The forecast growth in world demand for copper (excluding the United States) averages 2.7 per cent/year, to 13.6 Mt in the year 2000, and 1.9 per cent/year for the United States, to 2.5 Mt in the same period (Jolly, 1985). The World Bank (1984) suggests lower growth for the world at 1.4 per cent for the period 1979/81 to 1995. The growth is unlikely to affect the price.

With the recent low prices, many privately owned mines have either closed as in the United States or reduced the operating costs and boosted mine head grade to cater for the worst possible copper price.

As outlined by McCutcheon (1985) the effect of these mine closures has been a fall in incremental copper production. This will, McCutcheon forecasts, push up the price to $1,936-$2,024/t (88-92¢/lb) in 1985 United States dollar terms, until 1990. However, this price is not expected to be sustained, because of the current substitution which is predicted to continue.

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TABLE 3.3. WORLD MINE PRODUCTION OF COBALT

(Metric tonnes)

	1981	1982 b/	1983 b/	1984 b/
Australia	2 900	3 500	2 200	2 000
Botswana b/	250	250	270	n.a. a/
Canada	2 280	1 500	1 450	2 000
Cuba b/	1 720	1 500	1 400	2 200
Finland b/	1 030	1 000	1 000	1 200
Morocco	790	700	-	-
New Caledonia b/	140	500	270	300
Philippines b/	1 000	500	450	200
Union of Soviet Socialist Republics b/	2 250	2 350	2 200	2 700
Zaire	15 500	11 300	9 100	14 000
Zambia	3 420	3 250	3 200	4 000
Zimbabwe	100	60	90	n.a. a/
Other market-economy countries	-	-	-	500
Total	31 380	26 460	21 630	29 100

Source: United States Bureau of Mines and others.

a/ Included in "Other market-economy countries" (separate data not available).

b/ Estimated.

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TABLE 3.4. WORLD MINE PRODUCTION OF COPPER

(Thousands of metric tonnes)

	1981	1982	1983	1984 b/
Australia	231	245	261	236
Canada	691	613	653	707
Chile	1 081	1 242	1 257	1 250
Papua New Guinea	165	170	183	164
Peru	328	356	322	370
Philippines	302	293	271	250
Poland	295	376	402	380
South Africa and Namibia	255	256	264	262
Union of Soviet Socialist Republics b/	1 140	1 150	1 180	1 000
United States of America	1 538	1 140	1 038	1 050
Yugoslavia	111	119	130	138
Zaire	505	503	502	525
Zambia	587	530 a/	515 a/	540
Others b/	1 053	1 152	1 239	1 402
Total	8 306	8 187	8 189	8 274

Source: World Metal Statistics, United States Bureau of Mines and others.

a/ Excludes output from Nchanga lead tailings project.

b/ Estimated.

3.3.3 Manganese

World mine production of manganese ore in 1984 is estimated to have been 23 Mt. This is equivalent to about 8 Mt of contained manganese (manganese ore typically ranges from 35-54 per cent Mn). The United States imported an estimated 373,000 t of manganese ore and 455,000 t of ferromanganese in 1984 (ferromanganese ranges from 74-95 per cent Mn). The output from 3 Mt of dry nodules is 454,000 t/year of ferromanganese (at 78 per cent Mn) (table 3.2).

Ninety-five per cent of manganese ore production goes towards steel production. Demand for manganese is forecast to grow at 1.4 per cent/year, to 10 Mt in the year 2000 (Jones, 1985), in line with steel production. The increase in ferromanganese production is expected to come from countries that have low energy costs and manganese ore deposits, such as South Africa and Brazil.

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The price of ferromanganese is unlikely to increase in real terms in the immediate future. Recently, ferromanganese producers tried to put up their prices, but there was considerable resistance from buyers, and the profits of ferromanganese producers have suffered as a result (Brown and Murphy, 1985).

The cost of transporting manganese ore from the mine site to port is about 50 per cent of the total production cost (i.e. f.o.b. cost). The cost of ocean shipping adds to the overall cost. In past years, ocean freight has been one third of the cost of imported ore at eastern ports of the United States. This means that manganese production costs are highly dependent on freight costs, which over the last few years have been low because of sluggish world trade.

Because of such low rates of growth in manganese consumption and because reserves are about five times as great as the high forecast of 1980-2000 cumulative world demand, excluding ocean nodules (Jones, 1985), the price of manganese or ferromanganese is not expected to increase in real terms.

3.3.4 Nickel

World mine production of nickel in 1983 was 637,100 t (table 3.5). The output from 3 Mt nodules (dry) would be 36,700 t, approximately 6 per cent of present world production. The demand for nickel is predicted to increase at a rate of 3.1 per cent/year for the world, excluding the United States, to 910,000 t in the year 2000, and at 2.5 per cent/year for the United States, to 245,000 t in the year 2000 (Sibley, 1985). This compares with the World Bank (1984) which suggests lower growth for the world at 1.1 per cent for the period 1979/81 to 1995.

United States consumption in 1983 was 185,800 t, of which 138,500 t was imported.

Nickel may be substituted in certain applications. Just now it is being substituted for other metals in alloys owing to the low price. The price is predicted by Telewiak (1985) to increase in real terms in the long term as over-capacity is reduced. In constant 1984 United States dollars, the realized price for producers could be close to $3/lb by 1990 and remain at the level through the 1990s.

3.4 Metal prices

The prospect of any increase in the real prices of the metal products for a deep-sea nodule operation is unlikely according to the current outlook, apart from nickel, which may increase in the long term. In table 3.6, which shows the four metal products prices over the last 10 years, there is a definite downward trend when the prices are compared at the second half of 1984 on a dollar value basis. This downward trend is not considered likely to continue but prices will probably not increase appreciably over the next 20 to 30 years in real terms as technological improvements in exploration, mining and processing of metals throughout the world reduce production costs.

Davies (1983) has emphasized that metal consumption did not rise with industrial production over the seven years prior to 1981, as it had over the previous 24 years. The impact of this is that demand will be much slower to improve during high growth rates.

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TABLE 3.5. WORLD MINE PRODUCTION OF NICKEL

(Thousands of metric tonnes)

	1980	1981	1982	1983
Albania b/	8.5	8.8	8.5	9.0
Australia	74.3	74.4	88.6	76.6
Botswana	15.4	18.3	17.8	18.0
Brazil	2.5	2.5	5.3	10.7
Canada	188.5	166.8	92.7	128.1
China, excl. Taiwan Province b/	11.0	11.0	12.0	12.0
Colombia	-	-	5.0	15.8
Cuba	38.2	40.3	37.6	39.6
Dominican Republic	15.5	17.9	6.0	15.3
Finland	6.4	6.9	6.3	5.3
Greece	14.6	11.8	5.5	8.4
Indonesia	40.6	49.4	48.5	33.3
New Caledonia	86.6	78.2	60.1	42.3
Philippines	38.3	29.2	19.7	17.5
South Africa	25.7	25.0	20.5	20.5
Union of Soviet Socialist Republics b/	143.0	150.0	170.0	170.0
United States of America	13.3	11.0	2.9	-
Yugoslavia	0.5	2.0	3.5	3.6
Zimbabwe	14.3	15.1	13.4	8.3
Others a/	12.1	5.0	5.3	2.8
Total	749.3	723.6	629.2	637.1

Source: World Metal Statistics and others.

a/ Includes Burma, the German Democratic Republic, Guatemala, Morocco, Norway and Poland; there has been no production in Guatemala since 1980.

b/ Estimated.

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TABLE 3.6. HALF-YEARLY AVERAGES OF COBALT, COPPER, NICKEL AND FERROMANGANESE PRICES - CURRENT AND ESCALATED WITH THE UNITED STATES CONSUMER PRICE INDEX

Half year		Current prices (Half-year averages)					Escalated prices (Half-year averages)			
		Co	Cu	Ni	FeMn	CPI	Co	Cu	Ni	FeMn
1	1975	3.97	64.17	2.01	441.7	64.1	7.88	127.40	4.00	877.2
2	1975	4.00	62.97	2.14	413.9	66.6	7.65	120.40	4.09	791.1
1	76	4.17	64.45	2.20	383.0	68.1	7.80	120.50	4.11	716.0
2	76	4.67	71.20	2.27	371.7	70.0	8.49	129.50	4.13	676.0
1	77	5.22	70.01	2.40	340.9	72.5	9.17	122.93	4.21	598.6
2	77	6.00+	61.60	2.14	313.3	74.7	10.23	104.98	3.65	533.9
1	78	7.09	63.27	2.11	310.7	77.4	11.66	104.06	3.46	511.0
2	78	16.14	66.86	2.08	357.0	81.0	25.34	105.08	3.27	561.1
1	79	24.17	89.13	2.41	421.8	85.3	36.07	133.02	3.59	629.5
2	79	25.00	95.18	3.03	458.8	90.9	35.01	133.30	4.24	642.5
1	80	25.00	106.71	3.21	405.0	97.6	32.61	139.18	4.19	528.2
2	80	25.00	98.12	3.45	421.6	102.5	31.05	121.86	4.28	523.6
1	81	21.67	85.50	3.45	407.5	107.8	25.59	100.97	4.07	481.2
2	81	20.00*	81.99	3.41	414.4	112.9	22.55	92.45	3.84	489.4
1	82	12.50*	75.10	3.20	405.6	155.5	13.78	82.77	3.53	447.0
2	82	12.50	70.70	3.20	387.8	118.8	13.39	75.76	3.43	415.5
1	83	12.50	81.48	3.20	328.9	119.6	13.30	86.73	3.41	350.1
2	83	12.50	74.24	3.20	328.3	122.3	13.01	77.28	3.33	341.7
1	84	12.50	73.84	3.20	330.9	124.8	12.75	75.32	3.26	337.5
2	84	12.34	62.55	3.20	333.0	172.3	12.34	62.55	3.20	333.0

Cobalt: shot/cathode price (f.o.b. New York and Chicago) ($/lb)

Copper: *Metals Week* US producer/refinery price (f.o.b. quotation in *Metals Week* US producer/delivered price less 1.4¢ shipping cost) (¢/lb)

Nickel: cathode/major producer price (f.o.b. shipping point, US) ($/lb)

Ferromanganese: 78 per cent Mn imported price (f.o.b. Pittsburgh or Chicago warehouse) ($/long ton)

+ List price suspended 28 July 1977-29 November 1977, *Metals Week* producer price used for this period.

* List price suspended 3 August 1981-1 February 1982.

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Considerable time can be spent in determining the most likely price in the future, but it does not change the fact that nobody knows the future price. Therefore, for the base case, the average price for each metal product in March 1985 was used.

3.4.1 Cobalt

The final product of cobalt from the Cuprion process can be more or less complex depending on the requirements of the market (King and Pasho, 1979). It is expected that cobalt powder will be produced, but estimates of production cost do not specify the quality of this powder. For this study, it is assumed that it is coarse powder and so the cobalt shot price is used. This price is the same for shot as for cathodes in 250 kg lots. The shot price quoted by Metals Week is the f.o.b. price, Chicago and New York. (The quoted price is based on Afrimet-Indussa prices.) The average shot price for March 1985 was $11.70/lb, i.e. $25,740/t.

3.4.2 Copper

Copper is produced as cathodes in the Cuprion process. The price used in this study is the Metals Week (MW) United States (US) producer/refinery price quoted by Metals Week. This price is an f.o.b. quotation of the MW US producer/delivery price less 1.4 /lb shipping cost. The MW US producer/delivery price is a weighted average based on estimated United States refined copper production and current cathode selling prices of United States producers, quoted on a delivered basis. The average MW US producer/refinery price for March 1985 was 64.047¢/lb, equivalent to $1,410/t.

3.4.3 Ferromanganese

The ferromanganese plant produces ferromanganese with 78 per cent manganese (Mn) content. The price used in this study is the 78 per cent Mn "imported" ferromanganese price. This price is a United States dealer quote, f.o.b. Pittsburgh or Chicago warehouses (Metals Week). The "imported" price is for alloy, 78 per cent Mn and 7 per cent C (carbon). The price is quoted as a range - the average is used. The average price for March 1985 was $330/long ton, equivalent to about $325/t.

3.4.4 Nickel

Nickel is produced as cathodes from the Cuprion process, apart from a small quantity of powder, which is washed, dried and briquetted. The cathode/major producer price is used in this study. This price is an f.o.b. quotation from the United States shipping point, i.e. producer's site. The nickel price is for cathodes at 99.97 per cent Ni. The average price for March 1985 was 3.245¢/lb, equivalent to $7,155/t.

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IV. CASH FLOW ANALYSIS

Profitability was assessed by calculating the discounted cash flow rate of return (DCFROR). The United States Bureau of Mines MINSIM programme was used to compute the results. The programme has the facility to input point estimates for each variable from which DCFROR is calculated or, given a DCFROR, the required metal price is determined. Where the programme becomes a very useful tool is in the simulation mode. All prices, costs, etc., can be input in ranges, thereby allowing more realistic estimations of each variable. The output from the simulation is in the form of a distribution of likely DCFRORs with the mean value calculated. The simulation uses the Monte Carlo technique to select values for each year from the input distribution of the cost or price variable. The distribution is not limited to a normal distribution, but allows for the calculation of skewed distributions by fitting a specialized least-squares regression curve. (See annex II; also Thompson, 1983 and Masson, 1983.) The disadvantage of this simulation technique is that all variables are assumed to be independent, whereas this is not true in all cases, e.g., in reality, the grades of copper and nickel are frequently related. However, it is generally true and so the results are more realistic than the point estimate.

The programme allows for the calculation of a discrete DCFROR or a continuous DCFROR. The discrete mode assumes that all expenditure and revenue transactions for a particular year occur at the same time, whereas the continuous mode allows for the spread of these costs over each year using the formula (Thompson, 1983):

$$\text{Net present value} = \sum_{n=1}^{L} C_n \cdot \frac{e^r - 1}{re^{rn}} = 0$$

where C = each year's net after-tax cash flow;

L = life of operation in years;

n = sequential number of year being discounted;

r = annual compound interest rate (as a decimal);

e = a constant (2.71828.....)

The results showed that DCFROR was invariably zero or below. In order that the simulation could be run to show the full range of results above and below zero, the programme was amended to allow the calculation of negative DCFRORs. A DCFROR of zero means that expenditure in constant dollar terms equals revenue in constant dollar terms over the life of the operation or, stated another way, the return on expenditure in current dollars equals the rate of inflation. Similarly a negative DCFROR indicates the degree to which the return on expenditure falls short of the inflation rate.

The escalation rates for the metal prices and operating and capital costs were assumed to be the same and so costs and prices were kept in constant-dollar terms

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throughout (i.e. constant March 1985 $US), so the DCFROR results given are real rates. Where loan repayments or royalty payments were time-dependent, those items were equated to constant-dollar terms by de-escalating the values.

4.1 Base case analysis

Under the Law of the Sea Convention, annex IV, article 13, paragraph 5, the Enterprise will negotiate with host countries for tax-exempt status. Under article 10 of the same annex, the Enterprise is required to make payments to ISA; however, the details of these payments are not specified. For this study, it was assumed that the Enterprise did not make payments to ISA or pay taxes. The Enterprise was used as the base case with full equity.

With a new mining venture, such as mining the ocean floor where there are many unknowns, it was considered that an 18 per cent DCFROR or greater was necessary to encourage investment in such a high-risk venture. Metal price determinations were calculated to give 18 per cent to 26 per cent DCFROR (table 4.1). It was assumed that the ratio of the revenue from each metal remained as it was in March 1985.

TABLE 4.1. PRICE DETERMINATION FOR THE ENTERPRISE (WITH FULL EQUITY) BASE CASE WITH GIVEN DCFRORs

DCFROR	Revenue required per tonne of dry nodules ($/t)	Cobalt		Copper		Nickel		Ferromanganese	
		$/t	($/lb)	$/t	($/lb)	$/t	($/lb)	$/t	($/long ton)
18	366	48 950	(22.25)	2 670	(1.21)	13 540	(6.15)	610	(620)
20	405	54 150	(24.61)	2 950	(1.34)	14 980	(6.81)	680	(690)
22	450	60 240	(27.38)	3 280	(1.49)	16 660	(7.57)	750	(770)
24	504	67 370	(30.62)	3 670	(1.67)	18 630	(8.47)	840	(860)
26	566	75 750	(34.43)	4 130	(1.88)	20 950	(9.52)	950	(965)
March 1985 prices		25 740	(11.70)	1 410	(0.64)	7 155	(3.25)	325	(330)

4.2 Cost distribution

The base case in this study used point estimates of the most likely costs. As mentioned, the disadvantage of this is the low levels of confidence involved. For this reason a range or distribution of each input variable was compiled.

The ranges of the input variables is given in table 4.2, and information on the determination of their distributions in annex III.

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TABLE 4.2. DISTRIBUTIONS OF INPUT VARIABLES

	Range		
	Low limit (-%)	High limit (+%)	Distribution type
1. Capital			
(a) Exploration	-10	+ 50	Skewed (positive)
(b) Research and development	-10	+ 60	Skewed (positive)
(c) Mining capital	-10	+100	Skewed (positive)
(d) Transport capital	-15	+ 15	Normal
(e) Slurry terminal	-30	+ 50	Skewed (positive)
(f) Slurry pipeline	-40	+ 60	Skewed (positive)
(g) Process plant	-10	+ 60	Skewed (positive)
2. Operating			
(a) Mine ships	-20	+ 60	Skewed (positive)
(b) Transport ships	-20	+ 30	Skewed (positive)
(c) Processing	-10	+ 30	Skewed (positive)
(d) Transport to market	-50	+ 50	Normal
3. Grade			
(a) Cobalt	-10	+ 10	Normal
(b) Copper	-10	+ 10	Normal
(c) Manganese	-10	+ 10	Normal
(d) Nickel	-10	+ 10	Normal
4. Recovery			
(a) Cobalt	- 8	+ 8	Normal
(b) Copper	- 2	+ 2	Normal
(c) Manganese	- 9	+ 9	Normal
(d) Nickel	- 2	+ 2	Normal

Note: The determination of these input variables is given in annex III.

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4.3 Price distribution

For the simulation, price ranges were used, based on present market trends and historical trends and also on advice from the mineral commodity specialists at the Bureau of Mineral Resources, Geology and Geophysics. It was considered that the most probable price would be the current (March 1985) price, except for nickel, where a 10 per cent increase was considered to be most probable.

4.3.1 Cobalt

Probability	Price, \$/t (\$/lb)
0.05	14 200 (6.45)
0.20	20 000 (9.08)
0.40	25 740 (11.70)
0.30	31 500 (14.33)
0.05	37 300 (16.95)

The cobalt price is expected to remain stable at the current level or within ± 25%. There is a low probability that it might fluctuate within ± 50 per cent. If there is any change an increase is considered more likely than a decrease.

4.3.2 Copper

Probability	Price, \$/t (¢/lb)
0.10	1 270 (58)
0.20	1 410 (64)
0.16	1 550 (70)
0.14	1 690 (77)
0.12	1 830 (83)
0.10	1 970 (90)
0.08	2 110 (96)
0.06	2 250 (102)
0.04	2 390 (109)
0.02	2 530 (115)

The price of copper is expected to range between \$1,267/t and \$2,534/t, with a definite upward tendency from the present price of \$1,410/t. Within the last five years the price has varied upwards to this limit. However, new trend lines in copper price are possibly being formed. As the present price is extremely low, the range of prices is taken as -14 per cent to +90 per cent.

4.3.3 Ferromanganese

Probability	Price, \$/t
0.05	250
0.30	320
0.30	380
0.20	450
0.10	510
0.05	570

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The present price of ferromanganese (78 per cent Mn content) is also particularly low. For this reason the most probable price is expected to be between the present price and a 20 per cent rise. The full range is taken as -20 per cent and +80 per cent.

4.3.4 Nickel

Probability	Price, $/t
0.10	5 710 (2.60)
0.15	6 425 (2.90)
0.20	7 140 (3.25)
0.25	7 850 (3.60)
0.20	8 570 (3.90)
0.10	9 280 (4.20)

The price range for nickel is expected to be from -20 per cent to +30 per cent. There is a high probability that the price will go up in line with the relatively good prospects for nickel detailed in the Revenue estimation section 3.3.4.

4.4 Base case simulation

As shown in table 4.3, as the metal prices are weighted upwards they outweigh the costs which are similarly weighted to give a mean DCFROR of 1.88 per cent, which is 1.81 per cent higher than the point estimate of the base case. The range of DCFRORs is only 6 per cent, with the maximum DCFROR well below the 18 per cent threshold required to make the venture viable.

TABLE 4.3. SIMULATION RESULTS FOR THE ENTERPRISE (WITH FULL EQUITY) (BASE CASE)

Rate of return (%)	Frequency distribution (%)	
-1	2.7	***
0	5.3	*****
1	26.0	**************************
2	38.7	***************************************
3	25.3	*************************
4	2.0	**

Mean rate of return: 1.88%.

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4.5 Enterprise finance

The financial arrangements of the Enterprise, as set out in the law of the sea Convention, annex IV, article 11, are that half the equity will be provided by State parties in the form of an interest-free loan. The other half will be obtained through commercial loans guaranteed by the State parties. It is assumed for this study that the commercial loan will attract a 10 per cent interest rate and would be paid back over the 20 years of full production.

It is assumed that the bank loan would be repayed in equal instalments over the 20 years, and thus the real value of the repayments will drop each year because of escalation. The escalation rate is assumed to be 7.3 per cent. See annex IV for details of the bank loan repayments.

After the first venture, the law of the sea Convention requires the Enterprise to be self-supporting, with no capital input from any Member State or guarantees for bank loans. If the Enterprise is to have enough capital in reserve to start a second mining venture, then it will be required to achieve a DCFROR that will produce full equity plus the loan repayment on the first venture.

The simulation result of DCFROR for this case with full equity and loan repayment is given in table 4.4. The result is a mean rate of return of -2.56 per cent, which is a drop of over 4 per cent from the base case. No results had positive DCFRORs, which indicates that expenditure was higher than revenue in all cases.

If the Enterprise is to commence the second operation with half equity, then DCFROR is calculated on half equity for the first venture and half of the loan repayment. As shown in table 4.5, the mean rate of return for this scenario is 1 per cent and the range is from -3 per cent to +4 per cent.

TABLE 4.4. SIMULATION RESULTS FOR THE ENTERPRISE WITH FULL EQUITY AND LOAN REPAYMENTS FOR EQUITY BORROWED (i.e. ALLOWANCE MADE FOR STARTING SECOND VENTURE WITH FULL EQUITY)

Rate of return (%)	Frequency distribution (%)	
-7	0.7	*
-6	1.3	*
-5	6.0	******
-4	14.0	**************
-3	26.0	**************************
-2	29.3	*****************************
-1	20.0	********************
0	2.7	***

Mean rate of return: -2.56%.

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TABLE 4.5. SIMULATION RESULTS FOR THE ENTERPRISE WITH HALF EQUITY AND LOAN REPAYMENTS FOR HALF OF EQUITY BORROWED

Rate of return (%)	Frequency distribution (%)	
-3	0.7	*
-2	1.3	*
-1	12.0	************
0	23.3	***********************
1	25.3	*************************
2	23.3	***********************
3	10.7	***********
4	3.3	***

Mean rate of return: 1%.

4.6 Australian company

The DCFROR calculations for the Australian company are based on full equity financing.

Under annex III, article 13 of the law of the sea Convention, any contractor mining the ocean floor is required to make certain payments to the International Sea-Bed authority. The charges can be divided into three:

(a) An application fee of $US 500,000 is required to be paid when applying for approval of a plan of work within a non-reserved area.

(b) Upon approval of a plan of work, an annual fixed fee of $US 1 million is required to be paid until production starts.

(c) Production charge. When production commences, there is a choice of two charges to be paid by the contractor. One is based solely on a percentage of the value of the processed metal produced. The other is based partly on a percentage of the value of the processed metal produced and partly on a percentage of the attributable net proceeds of the contractor, the percentage rate being dependent on the rate of return on investment.

In calculating the payments required for the Australian company, the straight percentage of the value of the processed metal produced was chosen. The annual rate for the first 10 years of production is 5 per cent and from year 11 onwards it is 12 per cent. The pre-production charge of $US 1 million/year is payable each year in dollars of the day. The $US 1 million charge was deflated for each year of payment to the first year of production at a rate of 7.3 per cent (the average rate of the United States CPI over the last 10 years). A summary of the payments is given below, based on a pre-production period of 11 years.

Year	Payment
	$
1	500 000
2	1 000 000
3	932 000
4	868 600
5	809 500
6	754 400
7	703 100
8	655 200
9	611 000
10	569 000
11	530 000
12-21	5% of metal value
22-34	12% of metal value

The production charge of 5 per cent and 12 per cent of metal value is $29 million/year and $69.7 million/year respectively at March 1985 metal prices. If the metal prices rose to the level mentioned in the previous section to achieve an 18 per cent per annum DCFROR (table 4.1), the production charge would be $54.9 million/year (5 per cent) and $131.8 million/year (12 per cent).

The Australian company, which would be required to make payments to ISA, is estimated to have a mean DCFROR of 0.02 per cent before tax. This is a drop of 1.86 per cent from the Enterprise (base case). The range of DCFRORs is +2 per cent to -4 per cent. The distribution from the simulation is given in table 4.6.

TABLE 4.6. SIMULATION RESULTS FOR AN AUSTRALIAN COMPANY USING THE CUPRION PROCESS, BEFORE TAX

Rate of return (%)	Frequency distribution (%)	
-4	0.7	*
-3	2.0	**
-2	6.0	******
-1	21.3	*********************
0	34.7	***********************************
1	26.7	***************************
2	8.7	*********

Mean rate of return: 0.02%.

4.7 Taxation

An Australian company would be required to pay Australian income tax. The rate of the present Australian corporate income tax for companies is 46 per cent of gross revenue less operating costs and depreciation. This would reduce DCFROR from 0.02 per cent to -1.19 per cent and the maximum of the range would drop from +2 per cent to 1 per cent. As the company would not be making any profit, the difference between "before tax" and "after tax" is only slight. If the venture were to become profitable, the difference between before and after tax DCFROR would become more significant.

An established Australian company could use the losses in this venture to reduce its overall tax liability. However, in this study the feasibility for the Australian company of undertaking this venture was considered in isolation from its existing activities.

4.8 Alternative processes

Several nodule-processing methods are available (table 2.1). The base case in this study is based on the Cuprion process as detailed by Hillman (1983), but the reduction ammonia leach (RAL) process and the pyrometallurgical process were also considered for comparison. The RAL process is similar to the Cuprion process but there are significant differences in metal recovery and cost. Costs of these two processes were taken from Little (1984) and escalated to March 1985 dollars. Little (1984) gives total capital costs and total operating costs with no breakdown, so there may be some over- and under-estimations in the component cost areas.

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TABLE 4.7. SIMULATION RESULTS FOR AN AUSTRALIAN COMPANY USING THE CUPRION PROCESS, AFTER TAX

Rate of return (%)	Frequency distribution (%)	
-5	2.7	***
-3	10.7	***********
-2	23.3	***********************
-1	31.3	*******************************
0	29.3	*****************************
1	2.7	***

Mean rate of return: -1.19%.

4.8.1 Pyrometallurgical process

Little's (1984) estimate of the capital cost is $1,112 million (first quarter 1984 $US). This was escalated for skilled labour (30 per cent), steel (25 per cent), construction materials (25 per cent) and equipment (20 per cent) indexes, to give a total cost of $1,134 million. The construction period of six years for a Cuprion process plant was assumed to be the same for a pyrometallurgical process plant.

The estimate by Little (1984) for the operating cost of the pyrometallurgical process is $541 million/year (first quarter 1984 $US). This was escalated for fuel and power (60 per cent), industrial materials (20 per cent) and unskilled labour (30 per cent) indexes to give an annual cost of $548 million. The operating cost of the port is $10.2 million, which gives a total operating cost of $558.2 million. This gives $186.1/t of nodules (dry) per year processed. The handling facilities for the nodules for the Cuprion process will not be suitable for the pyrometallurgical process, so costs may be higher for handling, but they are assumed for this study to be the same.

The recovery factors for the four metal products from the pyrometallurgical process are given in table 4.8.

The effect on the profitability of both the Enterprise and the Australian company is negative using this process, as shown in tables 4.9 and 4.10, but this process is proven and may be more attractive to an operator than the Cuprion. The mean DCFROR for the Enterprise drops from 1.88 per cent for the Cuprion process to -2.90 per cent for this process and, for the Australian company, it drops from 0.02 per cent to -13.67 per cent. Both are skewed to the negative side, with very low minima.

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TABLE 4.8. PYROMETALLURGICAL PROCESS PRODUCT RECOVERY FACTORS

Metal	Recovery factor (%)
Cobalt	70
Copper	90
Manganese (ferromanganese)	85
Nickel	90

TABLE 4.9. SIMULATION RESULTS FOR THE ENTERPRISE (WITH FULL EQUITY) USING THE PYROMETALLURGICAL PROCESS

Rate of return (%)	Frequency distribution (%)	
-9	0.7	*
-8	0.7	*
-7	3.3	***
-6	4.0	****
-5	8.7	*********
-4	10.7	***********
-3	24.7	*************************
-2	26.7	***************************
-1	16.7	*****************
0	4.0	****

Mean rate of return: -2.90%.

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TABLE 4.10. SIMULATION RESULTS FOR AN AUSTRALIAN COMPANY (BEFORE TAX) USING THE PYROMETALLURGICAL PROCESS

Rate of return (%)	Frequency distribution (%)	
-40	0.4	
-34	0.4	
-33	0.8	*
-32	0.8	*
-31	0.4	
-30	0.4	
-29	0.4	
-28	0.4	
-27	0.8	*
-26	2.0	**
-25	0.8	*
-24	0.8	*
-23	1.2	*
-22	1.6	**
-21	0.8	*
-20	2.0	**
-19	2.0	**
-18	3.2	***
-17	3.6	****
-16	3.2	***
-15	5.6	******
-14	6.0	******
-13	10.0	**********
-12	8.8	*********
-11	9.6	**********
-10	9.2	*********
-9	9.6	**********
-8	8.0	********
-7	4.0	****
-6	2.8	***
-4	0.4	

Mean rate of return: -13.67%.

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4.8.2 Reduction ammonia leach (RAL) process

Little's (1984) estimate for the capital cost of this process is $1,112 million (first quarter 1984 $US). This cost was escalated with the same index ratios as for the pyrometallurgical process, and gave a March 1985 capital cost of $1,134 million. A construction period of six years was again assumed.

Little's (1984) estimate of the annual operating cost was $483 million for 3 Mt of dry nodules. This was escalated for unskilled labour (30 per cent), industrial materials (30 per cent), fuel (25 per cent) and skilled labour (15 per cent) indexes to give $491.7 million. Added to this cost is the operation of the port, which gives a combined cost of $501.9 million, or $167.3/t.

The recovery factors for the four metal products from the RAL process are given in table 4.11.

As with the pyrometallurgical process, no improvement in profitability is found with the estimated costs, as shown in tables 4.12 and 4.13. The mean DCFROR for the Enterprise drops from 1.88 per cent to 0.43 per cent and for the Australian company from 0.02 per cent to -4.71 per cent.

The Cuprion process is not very different from the RAL process and profitability is similar for the Enterprise. With the present uncertainty on costs, the difference between the two is regarded as insignificant. The higher recovery of manganese for the pyrometallurgical process can only put it ahead of the other processes given a high price for ferromanganese.

TABLE 4.11. REDUCTION AMMONIA LEACH PROCESS
PRODUCT RECOVERY FACTORS

Metal	Recovery factor (%)
Cobalt	65
Copper	90
Manganese (ferromanganese)	85
Nickel	90

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TABLE 4.12. SIMULATION RESULTS FOR THE ENTERPRISE (WITH FULL EQUITY) USING THE REDUCTION AMMONIA LEACH PROCESS

Rate of return (%)	Frequency distribution (%)	
-3	0.7	*
-2	6.0	******
-1	12.0	************
0	26.0	**************************
1	38.7	*************************************
2	16.2	****************
3	0.7	*

Mean rate of return: 0.43%.

TABLE 4.13. SIMULATION RESULTS FOR AN AUSTRALIAN COMPANY (BEFORE TAX) USING THE REDUCTION AMMONIA LEACH PROCESS

Rate of return (%)	Frequency distribution (%)	
-13	0.7	*
-11	2.0	**
-10	2.0	**
-9	3.3	***
-8	3.3	***
-7	6.7	*******
-6	7.3	*******
-5	18.0	******************
-4	28.0	****************************
-3	14.0	**************
-2	12.7	*************
-1	2.0	**

Mean rate of return: -4.71%.

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V. CONCLUSIONS

1. At the present metal prices, the mining of polymetallic nodules for cobalt, copper, nickel and manganese from the deep sea-bed is not a viable proposition, either for an Australian company or for the Enterprise; increases in aggregate metal prices, to as high as twice their present level, would be required to make the mining venture viable.

2. Even if the metal prices rise significantly for a 3 Mt/year operation, the volume of output of cobalt especially, and also of ferromanganese and nickel, would have a significant effect on the market. The metal prices would probably go down and it would be doubtful whether all output could be sold at market price.

3. The technology of mining nodules from the deep sea-bed has not yet been proved. For this reason, the venture must be considered high-risk and therefore a high discounted cash flow rate of return would be necessary in order to attract capital.

4. With the present metal price levels and ratios between the prices, the Cuprion process is more attractive than pyrometallurgical process and the reduction ammonia leach process.

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Annex I

COST INDEXES (UNITED STATES)

The table details the indexes used in escalating the cost estimates. The indexes were obtained from the United States Bureau of Mines (USBM) except for the United States CPI, which was obtained from International Financial Statistics (IFS), produced by the International Monetary Fund. The USBM indexes are based on Employment and Earnings and Wholesale Prices and Price Indexes, published by Bureau of Labor Statistics (BLS) of the United States Department of Labor, and on Engineering News Record (ENR). The source of each index is detailed below each column.

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TABLE (annex I). UNITED STATES COST INDEXES (for explanation of sources see text)

Year	Mining labour	Constrn labour	Equip. & parts	Bits & steel	Timber & lumber	Fuel	Tyres	Constrn material	Industrial material	Transport	CPI
BASE	5.89	1 996.70	184.90	197.30	196.80	258.80	158.80	185.00	171.20	185.70	100.00
1970 AVG	3.85	1 318.00	115.90	115.10	113.70	101.00	105.40	124.40	110.00	108.90	-
1971 AVG	4.06	1 487.00	121.40	121.80	135.50	106.80	110.30	141.07	114.00	123.50	-
1972 AVG	4.41	1 621.00	125.70	128.40	159.40	108.90	111.30	154.63	117.90	128.10	-
1973 AVG	4.73	1 725.00	130.70	136.20	205.20	128.70	115.70	168.42	125.90	133.00	-
1974 AVG	4.73	1 836.00	152.30	178.60	207.10	223.40	141.60	178.30	153.80	155.00	-
1975 AVG	5.90	1 983.00	185.20	200.90	192.50	257.50	155.40	193.27	171.50	178.40	65.30
1976 AVG	6.46	2 133.00	198.60	215.80	233.00	276.40	172.80	201.94	182.30	197.80	69.10
1977 AVG	6.94	2 264.00	213.70	230.30	276.50	308.10	181.50	228.61	195.10	211.10	73.60
1978 AVG	7.67	2 405.00	232.80	253.50	322.10	321.00	192.00	247.70	209.40	227.30	79.20
1979 AVG	8.48	2 564.00	255.60	283.40	354.20	444.50	219.40	266.10	236.20	264.40	88.10
1980 AVG	9.19	2 767.00	288.90	305.00	325.60	674.30	249.70	287.70	274.20	311.30	100.00
1981 AVG	10.06	3 025.00	320.80	333.80	325.10	805.90	270.20	310.33	304.10	355.30	110.40
1982 AVG	10.82	3 345.00	343.90	339.00	310.90	761.20	271.60	330.10	312.30	387.30	117.10
1983 AVG	11.27	3 587.00	351.90	343.30	352.60	684.30	260.00	352.89	315.70	395.40	120.90
1984 AVG	11.57	3 734.00	357.90	358.40	100.00	662.90	258.30	358.76	322.10	411.00	126.10
1985 JAN	11.77	3 759.00	360.40	357.40	343.20	636.20	262.00	358.32	323.20	413.60	128.10
1985 FEB	11.85	3 763.00	361.70	357.70	342.90	615.90	247.70	359.04	322.50	413.60	128.60
1985 MAR	11.82	3 765.00	361.80	358.20	345.00	620.70	247.00	359.38	322.60	413.60	129.20
Source	BLS	ENR	BLS	BLS	BLS	BLS	BLS	ENR	BLS	BLS	IFS

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Annex II

PROBABILITY METHODOLOGY (FOR CASH FLOW ANALYSIS)

Randomization is accomplished for the evaluator as follows:

(a) Each normally distributed random value is obtained by subtracting 6 from the sum of 12 uniformly distributed random numbers whose range is the open interval (0,1); this value is then multiplied by the standard deviation, which is assumed to be one sixth of the high and low values, and is added to the mean.

(b) For non-normal distributions, a specialized least-squares regression subroutine is used to fit a curve, in the form $y = F(x)$, to the cumulative probability defined by the four or more points. Random (y) values in the open interval (0,1) are distributed by solving the resultant equation [i.e., $y = F(x)$].

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Annex III

DETERMINATION OF DISTRIBUTIONS OF INPUT VARIABLES (TABLE 4.2)

1. Capital

Items (a), (b) and (g) (Exploration, Research and development, Process plant)

The distribution of costs of these items reflects the low uncertainty, as much work has already been carried out in these areas. The positive skewness of the distribution reflects the anticipated over-expenditure due to uncertainties, such as construction delays.

Item (c) (Mine ships)

The estimate of the total cost of these two ships in this study is low compared to other estimates mainly because of the use of Japanese-built as opposed to United States-built ships. As the estimate is low compared to other estimates it is felt that confidence in this low figure is also low. As a consequence the distribution of costs for this item is high on the upward side.

Items (d), (e) and (f) (Transport, Slurry terminal, Slurry pipeline)

The distributions of these three items is based on Andrews and others (1983).

2. Operating

Items (a) and (c) (Mine ships, Processing)

These items were assumed to be skewed positively, and the operating costs are likely to be higher than estimated rather than lower. The operation of the mining system still has to be proved at this stage and so the highest uncertainty is placed on this cost.

Item (c) (Transport ships)

This distribution reflects the estimates of Andrews and others (1983), which show a distribution of -13 per cent to +24 per cent.

Item (d) (Transport to market)

The location of the market affects the transport cost. The cost thus may vary considerably and so a low level of confidence is placed on it.

3. Grade

The distributions for grade have been assumed to be 10 per cent. If the grade varies more than this, it is assumed that the mine ship will move to an area where grade is expected to be more consistent.

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4. Recovery

Copper and nickel recoveries are unlikely to fluctuate very much with the Cuprion process. Cobalt recovery has been quoted as 65 per cent (Hillman, 1983) and 50 per cent (Pasho, 1979) and so a range from 50 per cent to 70 per cent was used. It is assumed that the final manganese recovery may vary with the various hydro- and pyro-metallurgical processes it goes through. Therefore the distribution for manganese recovery is set higher than the other three metals.

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Annex IV

LOAN REPAYMENTS FOR THE ENTERPRISE

(Total loan at year 14 a/ is $US 1,111.3 million, rate of interest 10 per cent, escalation rate 7.3 per cent)

(Millions of US dollars)

Year	Interest payments	Interest payments de-escalated	Repayment of principal	Repayment of principal de-escalated
14	111.1	111.1	19.4	19.4
15	109.2	101.8	21.3	19.9
16	107.1	93.0	23.7	20.6
17	104.7	84.8	25.8	20.9
18	102.1	77.1	28.4	21.4
19	99.3	69.8	31.2	22.0
20	96.2	63.0	34.4	22.5
21	92.7	56.6	37.8	23.1
22	89.0	50.6	41.6	23.7
23	84.8	45.0	45.7	24.3
24	80.2	39.6	50.3	24.9
25	75.2	34.6	55.4	25.5
26	69.7	29.9	60.9	26.1
27	63.6	25.4	67.0	26.8
28	56.9	21.2	73.7	27.5
29	49.5	17.2	81.0	28.2
30	41.4	13.4	89.1	28.9
31	32.5	9.8	98.1	29.6
32	22.7	6.4	107.9	30.3
33	12.0	3.1	118.8	31.1

a/ The loan repayments commence on the first year of full production.

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LOS/PCN/SCN.2/WP.10/Add.1
21 January 1986

ENGLISH ONLY

PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2

THE ENTERPRISE

ECONOMIC VIABILITY OF DEEP SEA-BED MINING OF POLYMETALLIC NODULES

Submitted by the delegation of Australia

Addendum

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Description of Computer Output

The first output details the income and expenditure for the Enterprise over 34 years. The bulk of the output is detailed costs with a summary page at the end.

The point estimates of costs used in the base case are the modes of the distributions used in base case simulation. The ranges of the distributions are given in the main text.

The second output initially gives details of the cost and price distributions that are used for each input. The detailed income and expenditure is for one only of the 150 simulations. The last two pages give a summary of the simulations with a histogram of the discounted cash flow rate of return (DCFROR).

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                 BUREAU OF MINERAL RESOURCES OF AUSTRALIA

                          FINANCIAL EVALUATION
    ENTERPRISE EVALUATION SIMLTN. 3M.TONNES NODULES(DRY)P.A. [CUPRION PROCESS]
                        BEGINNING OPERATION IN     1
                        AND ENDING OPERATION IN   34
                        WITH 11 PREPRODUCTION YEARS
                        USING  150 SIMULATION(S) AND
                        A TARGET RATE OF RETURN OF
                               0.1 PERCENT
                    CONTINUOUS DISCOUNTED CASHFLOW IS USED
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                TAX PARAMETER LIST BY INPUT RECORD


COMMODITY RECORD FOR COBALT
     SEVERANCE TAX OPTION = NO SEVERANCE TAX
     FIXED SEVERANCE AMOUNT ($1000) =      0.0
     DEPLETION ALLOWANCE OPTION = NO DEPLETION
     DEPLETION ALLOWANCE =  0.0
     FIXED DEPLETION AMOUNT ($1000) =    0.0
     PAID-FOR PERCENTAGE =      1.000

COMMODITY RECORD FOR COPPER
     SEVERANCE TAX OPTION = NO SEVERANCE TAX
     FIXED SEVERANCE AMOUNT ($1000) =      0.0
     DEPLETION ALLOWANCE OPTION = NO DEPLETION
     DEPLETION ALLOWANCE =  0.0
     FIXED DEPLETION AMOUNT ($1000) =    0.0
     PAID-FOR PERCENTAGE =      1.000

COMMODITY RECORD FOR NICKEL
     SEVERANCE TAX OPTION = NO SEVERANCE TAX
     FIXED SEVERANCE AMOUNT ($1000) =      0.0
     DEPLETION ALLOWANCE OPTION = NO DEPLETION
     DEPLETION ALLOWANCE =  0.0
     FIXED DEPLETION AMOUNT ($1000) =    0.0
     PAID-FOR PERCENTAGE =      1.000

COMMODITY RECORD FOR MANGANESE
     SEVERANCE TAX OPTION = NO SEVERANCE TAX
     FIXED SEVERANCE AMOUNT ($1000) =      0.0
     DEPLETION ALLOWANCE OPTION = NO DEPLETION
     DEPLETION ALLOWANCE =  0.0
     FIXED DEPLETION AMOUNT ($1000) =    0.0
     PAID-FOR PERCENTAGE =      1.000
RATE OF RETURN IS LESS THAN MINUS 90 PCT IN YEAR   13
RATE OF RETURN IS LESS THAN MINUS 90 PCT IN YEAR   14
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                                    1           2           3           4           5           6           7           8           9
GENERAL DATA * * * * * * * * * *

INVESTMENTS
   EXPLORATION - - - - - - - -   3500000.    3500000.    3500000.    3500000.    3500000.    3500000.          0.          0.          0.
   LAND ACQUISITION- - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
   RESEACH & DEVELOPMENT, - - -  16800000.   16800000.   16800000.   16800000.   16800000.   42000000.   42000000.          0.          0.
   INVEST. NUMBER 1- MINE- - -         0.          0.          0.          0.          0.          0.   47900000.   47900000.   47900000.
      LIFE - - - - - - - - - -          0           0           0           0           0           0          10          10          10
      DEPRECIATION - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 2- TRAN- - -         0.          0.          0.          0.          0.          0.   14000000.   14000000.   14000000.
      LIFE - - - - - - - - - -          0           0           0           0           0           0          10          10          10
      DEPRECIATION - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 4- PROC- - -         0.          0.          0.          0.          0.          0.          0.          0.   22100000.
      LIFE - - - - - - - - - -          0           0           0           0           0           0           0           0          10
      DEPRECIATION - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 5- PROC- - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - -          0           0           0           0           0           0           0           0           0
      DEPRECIATION - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 6- PROC- - -         0.          0.          0.          0.          0.          0.  132400000.  132400000.  132400000.
      LIFE - - - - - - - - - -          0           0           0           0           0           0          10          10          10
      DEPRECIATION - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
   EQUITY CAPITAL- - - - - - -  20300000.   20300000.   20300000.   20300000.   20300000.   45500000.  236300000.  194300000.  216400000.
   WORKING CAPITAL - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.

OPERATING COSTS PER UNIT

   MINE- - - - - - - - - - - -   0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
   TRANSPORT - - - - - - - - -   0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
   PROCESS - - - - - - - - - -   0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
UNITS TREATED- - - - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
MISC. OPERATING EXPENSES - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.

COMMODITY DATA * * * * * * * *

COBALT
   ORE GRADE - - - - - - - - -   0.002600    0.002600    0.002600    0.002600    0.002600    0.002600    0.002600    0.002600    0.002600
   MILL RECOVERY - - - - - - -   0.650000    0.650000    0.650000    0.650000    0.650000    0.650000    0.650000    0.650000    0.650000
   MILL CONCENTRATE GRADE- - -     1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
   SMELTER RECOVERY- - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   SMELTER CONCENTRATE GRADE -      1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000
   REFINER RECOVERY- - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - -     0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
      REFINER- - - - - - - - -     0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
   TRANS. COSTS/UNIT PROCESSED-
      TO SMELTER - - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO REFINERY- - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO MARKET- - - - - - - -     46.000      46.000      46.000      46.000      46.000      46.000      46.000      46.000      46.000
   PRICE/UNIT RECOVERED- - - -   25740.00    25740.00    25740.00    25740.00    25740.00    25740.00    25740.00    25740.00    25740.00
   UNITS RECOVERED - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
   REVENUES- - - - - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
   DEPLETION - - - - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
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   SEVERANCE TAX - - - - - - - -           0.         0.         0.         0.         0.         0.         0.         0.         0.
   ROYALTY PAYMENT - - - - - - -           0.         0.         0.         0.         0.         0.         0.         0.         0.

COPPER
   ORE GRADE - - - - - - - - - -     0.010400   0.010400   0.010400   0.010400   0.010400   0.010400   0.010400   0.010400   0.010400
   MILL RECOVERY - - - - - - - -     0.920000   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000
   MILL CONCENTRATE GRADE- - - -       1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
   SMELTER RECOVERY- - - - - - -     1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
   SMELTER CONCENTRATE GRADE - -        1.000      1.000      1.000      1.000      1.000      1.000      1.000      1.000      1.000
   REFINER RECOVERY- - - - - - -     1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - - -       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
      REFINER- - - - - - - - - -       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - - -        0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
      TO REFINERY- - - - - - - -        0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
      TO MARKET- - - - - - - - -        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
   PRICE/UNIT RECOVERED- - - - -      1410.00    1410.00    1410.00    1410.00    1410.00    1410.00    1410.00    1410.00    1410.00
   UNITS RECOVERED - - - - - - -           0.         0.         0.         0.         0.         0.         0.         0.         0.
   REVENUES- - - - - - - - - - -           0.         0.         0.         0.         0.         0.         0.         0.         0.
   DEPLETION - - - - - - - - - -           0.         0.         0.         0.         0.         0.         0.         0.         0.
   SEVERANCE TAX - - - - - - - -           0.         0.         0.         0.         0.         0.         0.         0.         0.
   ROYALTY PAYMENT - - - - - - -           0.         0.         0.         0.         0.         0.         0.         0.         0.

NICKEL
   ORE GRADE - - - - - - - - - -     0.013300   0.013300   0.013300   0.013300   0.013300   0.013300   0.013300   0.013300   0.013300
   MILL RECOVERY - - - - - - - -     0.920000   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000
   MILL CONCENTRATE GRADE- - - -       1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
   SMELTER RECOVERY- - - - - - -     1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
   SMELTER CONCENTRATE GRADE - -        1.000      1.000      1.000      1.000      1.000      1.000      1.000      1.000      1.000
   REFINER RECOVERY- - - - - - -     1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - - -       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
      REFINER- - - - - - - - - -       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - - -        0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
      TO REFINERY- - - - - - - -        0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
      TO MARKET- - - - - - - - -       46.000     46.000     46.000     46.000     46.000     46.000     46.000     46.000     46.000
   PRICE/UNIT RECOVERED- - - - -      7155.00    7155.00    7155.00    7155.00    7155.00    7155.00    7155.00    7155.00    7155.00
   UNITS RECOVERED - - - - - - -           0.         0.         0.         0.         0.         0.         0.         0.         0.
   REVENUES- - - - - - - - - - -           0.         0.         0.         0.         0.         0.         0.         0.         0.
   DEPLETION - - - - - - - - - -           0.         0.         0.         0.         0.         0.         0.         0.         0.
   SEVERANCE TAX - - - - - - - -           0.         0.         0.         0.         0.         0.         0.         0.         0.
   ROYALTY PAYMENT - - - - - - -           0.         0.         0.         0.         0.         0.         0.         0.         0.

MANGANESE
   ORE GRADE - - - - - - - - - -     0.268000   0.268000   0.268000   0.268000   0.268000   0.268000   0.268000   0.268000   0.268000
   MILL RECOVERY - - - - - - - -     0.440000   0.440000   0.440000   0.440000   0.440000   0.440000   0.440000   0.440000   0.440000
   MILL CONCENTRATE GRADE- - - -       1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
   SMELTER RECOVERY- - - - - - -     1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
   SMELTER CONCENTRATE GRADE - -        1.000      1.000      1.000      1.000      1.000      1.000      1.000      1.000      1.000
   REFINER RECOVERY- - - - - - -     1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - - -       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
      REFINER- - - - - - - - - -       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - - -        0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
      TO REFINERY- - - - - - - -        0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
      TO MARKET- - - - - - - - -       46.000     46.000     46.000     46.000     46.000     46.000     46.000     46.000     46.000
   PRICE/UNIT RECOVERED- - - - -       415.00     415.00     415.00     415.00     415.00     415.00     415.00     415.00     415.00
   UNITS RECOVERED - - - - - - -           0.         0.         0.         0.         0.         0.         0.         0.         0.
   REVENUES- - - - - - - - - - -           0.         0.         0.         0.         0.         0.         0.         0.         0.
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    DEPLETION - - - - - - - - - -          0.        0.        0.        0.        0.        0.        0.        0.        0.
    SEVERANCE TAX - - - - - - - -          0.        0.        0.        0.        0.        0.        0.        0.        0.
    ROYALTY PAYMENT - - - - - - -          0.        0.        0.        0.        0.        0.        0.        0.        0.

FINANCIAL SUMMARY  * * * * * *

CASH FLOW
    EXPENSED EXPLORATION +
    TOTAL REVENUES- - - - - - -            0.        0.        0.        0.        0.        0.        0.        0.        0.
    LESS MINE OPERATING COSTS -            0.        0.        0.        0.        0.        0.        0.        0.        0.
    LESS TRAN OPERATING COSTS -            0.        0.        0.        0.        0.        0.        0.        0.        0.
    LESS PROCESS OPERATING COSTS           0.        0.        0.        0.        0.        0.        0.        0.        0.
    LESS TRANS TO MARKET- - - -            0.        0.        0.        0.        0.        0.        0.        0.        0.
    LESS EXPLORATION COSTS- - -            0.        0.        0.        0.        0.        0.        0.        0.        0.
    LESS DEVELOPMENT COSTS- - -            0.        0.        0.        0.        0.        0.        0.        0.        0.
    LESS LOAN INT. PAYMENTS - -            0.        0.        0.        0.        0.        0.        0.        0.        0.
    LESS DEPRECIATION - - - - -            0.        0.        0.        0.        0.        0.        0.        0.        0.
    LESS TOTAL ROYALTY PAYMENTS-           0.        0.        0.        0.        0.        0.        0.        0.        0.

    EQUALS NET INCOME - - - - -            0.        0.        0.        0.        0.        0.        0.        0.        0.

    PLUS DEPRECIATION - - - - -            0.        0.        0.        0.        0.        0.        0.        0.        0.
    PLUS TOTAL DEPLETION USED -            0.        0.        0.        0.        0.        0.        0.        0.        0.
    PLUS DEFFERED DEDUCTIONS- -            0.        0.        0.        0.        0.        0.        0.        0.        0.
    LESS EQUITY INVESTMENT- - -     20300000.  20300000.  20300000.  20300000.  20300000.  45500000. 236300000. 194300000. 216400000.

    EQUALS CASH FLOW- - - - - -    -20300000. -20300000. -20300000. -20300000. -20300000. -45500000.-236300000.-194300000.-216400000.

ANALYSIS FIGURES
    CONTINUOUS RATE OF RETURN -       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
    NOTE - * INDICATES THAT A DUAL RATE OF RETURN EXISTED IN THAT YEAR
     18.00 PCT PRESENT VALUE- -    -18577824. -34095312. -47056608. -57882800. -66925584. -83855120.-157293760.-207732064.-254653552.
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                                      10          11          12          13          14          15          16          17          18

GENERAL DATA * * * * * * * * * *

INVESTMENTS
  EXPLORATION - - - - - - - - -        0.          0.          0.          0.          0.          0.          0.          0.          0.
  LAND ACQUISITION- - - - - -          0.          0.          0.          0.          0.          0.          0.          0.          0.
  RESEACH & DEVELOPMENT,- - -          0.    3200000.          0.          0.          0.          0.          0.          0.          0.
  INVEST. NUMBER 1- MINE- - -   47900000.   47900000.   72700000.          0.          0.          0.          0.          0.          0.
     LIFE - - - - - - - - - -         10          10          10           0           0           0           0           0           0
     DEPRECIATION - - - - - -          0.          0.          0.   12060000.   16850000.   21640000.   26430000.   31220000.   31220000.
     SALVAGE VALUE- - - - - -          0.          0.          0.          0.          0.          0.          0.          0.          0.
  INVEST. NUMBER 2- TRAN- - -   14000000.   14800000.   14800000.          0.          0.          0.          0.          0.          0.
     LIFE - - - - - - - - - -         10          10          10           0           0           0           0           0           0
     DEPRECIATION - - - - - -          0.          0.          0.    2880000.    5760000.    7160000.    8560000.    8560000.    8560000.
     SALVAGE VALUE- - - - - -          0.          0.          0.          0.          0.          0.          0.          0.          0.
  INVEST. NUMBER 4- PROC- - -   22100000.          0.          0.          0.          0.          0.          0.          0.          0.
     LIFE - - - - - - - - - -         10           0           0           0           0           0           0           0           0
     DEPRECIATION - - - - - -          0.          0.          0.    2210000.    4420000.    4420000.    4420000.    4420000.    4420000.
     SALVAGE VALUE- - - - - -          0.          0.          0.          0.          0.          0.          0.          0.          0.
  INVEST. NUMBER 5- PROC- - -   11050000.   11050000.          0.          0.          0.          0.          0.          0.          0.
     LIFE - - - - - - - - - -         10          10           0           0           0           0           0           0           0
     DEPRECIATION - - - - - -          0.          0.          0.    1105000.    2210000.    2210000.    2210000.    2210000.    2210000.
     SALVAGE VALUE- - - - - -          0.          0.          0.          0.          0.          0.          0.          0.          0.
  INVEST. NUMBER 6- PROC- - -  132400000.  132400000.  132400000.          0.          0.          0.          0.          0.          0.
     LIFE - - - - - - - - - -         10          10          10           0           0           0           0           0           0
     DEPRECIATION - - - - - -          0.          0.          0.   13240000.   26480000.   39720000.   52960000.   66200000.   79440000.
     SALVAGE VALUE- - - - - -          0.          0.          0.          0.          0.          0.          0.          0.          0.
  EQUITY CAPITAL- - - - - - -  227450000.  209350000.  554499584.          0.          0.          0.          0.          0.          0.
  WORKING CAPITAL - - - - - -          0.          0.  334599936.          0.          0.          0.          0.          0.          0.

OPERATING COSTS PER UNIT

  MINE- - - - - - - - - - - -     0.0         0.0       31.00000    31.00000    31.00000    31.00000    31.00000    31.00000    31.00000
  TRANSPORT - - - - - - - - -     0.0         0.0        8.83000     8.83000     8.83000     8.83000     8.83000     8.83000     8.83000
  PROCESS - - - - - - - - - -     0.0         0.0      123.53000   123.53000   123.53000   123.53000   123.53000   123.53000   123.53000
UNITS TREATED- - - - - - - - -         0.          0.    1500000.    2500000.    3000000.    3000000.    3000000.    3000000.    3000000.
MISC. OPERATING EXPENSES - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.

COMMODITY DATA * * * * * * * *

COBALT
  ORE GRADE - - - - - - - - -   0.002600    0.002600    0.002600    0.002600    0.002600    0.002600    0.002600    0.002600    0.002600
  MILL RECOVERY - - - - - - -   0.650000    0.650000    0.650000    0.650000    0.650000    0.650000    0.650000    0.650000    0.650000
  MILL CONCENTRATE GRADE- - -     1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  SMELTER RECOVERY- - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
  SMELTER CONCENTRATE GRADE -      1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000
  REFINER RECOVERY- - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
  OP. COSTS/UNIT PROCESSED
     SMELTER- - - - - - - - -     0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
     REFINER- - - - - - - - -     0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
  TRANS. COSTS/UNIT PROCESSED
     TO SMELTER - - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
     TO REFINERY- - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
     TO MARKET- - - - - - - -     46.000      46.000      46.000      46.000      46.000      46.000      46.000      46.000      46.000
  PRICE/UNIT RECOVERED- - - -   25740.00    25740.00    25740.00    25740.00    25740.00    25740.00    25740.00    25740.00    25740.00
  UNITS RECOVERED - - - - - -          0.          0.       2535.       4225.       5070.       5070.       5070.       5070.       5070.
  REVENUES- - - - - - - - - -          0.          0.   65250880.  108751392.  130501696.  130501696.  130501696.  130501696.  130501696.
  DEPLETION - - - - - - - - -          0.          0.          0.          0.          0.          0.          0.          0.          0.
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   SEVERANCE TAX - - - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
   ROYALTY PAYMENT - - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.

COPPER
   ORE GRADE - - - - - - - - - -   0.010400    0.010400    0.010400    0.010400    0.010400    0.010400    0.010400    0.010400    0.010400
   MILL RECOVERY - - - - - - - -   0.920000    0.920000    0.920000    0.920000    0.920000    0.920000    0.920000    0.920000    0.920000
   MILL CONCENTRATE GRADE- - - -     1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
   SMELTER RECOVERY- - - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   SMELTER CONCENTRATE GRADE - -      1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000
   REFINER RECOVERY- - - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   OP. COSTS/UNIT PROCESSED
       SMELTER- - - - - - - - - -    0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
       REFINER- - - - - - - - - -    0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO REFINERY- - - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO MARKET- - - - - - - - -      0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
   PRICE/UNIT RECOVERED- - - - -    1410.00     1410.00     1410.00     1410.00     1410.00     1410.00     1410.00     1410.00     1410.00
   UNITS RECOVERED - - - - - - -         0.          0.      14352.      23920.      28704.      28704.      28704.      28704.      28704.
   REVENUES- - - - - - - - - - -         0.          0.   20236320.   33727200.   40472640.   40472640.   40472640.   40472640.   40472640.
   DEPLETION - - - - - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
   SEVERANCE TAX - - - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
   ROYALTY PAYMENT - - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.

NICKEL
   ORE GRADE - - - - - - - - - -   0.013300    0.013300    0.013300    0.013300    0.013300    0.013300    0.013300    0.013300    0.013300
   MILL RECOVERY - - - - - - - -   0.920000    0.920000    0.920000    0.920000    0.920000    0.920000    0.920000    0.920000    0.920000
   MILL CONCENTRATE GRADE- - - -     1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
   SMELTER RECOVERY- - - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   SMELTER CONCENTRATE GRADE - -      1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000
   REFINER RECOVERY- - - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   OP. COSTS/UNIT PROCESSED
       SMELTER- - - - - - - - - -    0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
       REFINER- - - - - - - - - -    0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO REFINERY- - - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO MARKET- - - - - - - - -     46.000      46.000      46.000      46.000      46.000      46.000      46.000      46.000      46.000
   PRICE/UNIT RECOVERED- - - - -    7155.00     7155.00     7155.00     7155.00     7155.00     7155.00     7155.00     7155.00     7155.00
   UNITS RECOVERED - - - - - - -         0.          0.      18354.      30590.      36708.      36708.      36708.      36708.      36708.
   REVENUES- - - - - - - - - - -         0.          0.  131322864.  218871472.  262645760.  262645760.  262645760.  262645760.  262645760.
   DEPLETION - - - - - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
   SEVERANCE TAX - - - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
   ROYALTY PAYMENT - - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.

MANGANESE
   ORE GRADE - - - - - - - - - -   0.268000    0.268000    0.268000    0.268000    0.268000    0.268000    0.268000    0.268000    0.268000
   MILL RECOVERY - - - - - - - -   0.440000    0.440000    0.440000    0.440000    0.440000    0.440000    0.440000    0.440000    0.440000
   MILL CONCENTRATE GRADE- - - -     1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
   SMELTER RECOVERY- - - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   SMELTER CONCENTRATE GRADE - -      1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000
   REFINER RECOVERY- - - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   OP. COSTS/UNIT PROCESSED
       SMELTER- - - - - - - - - -    0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
       REFINER- - - - - - - - - -    0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO REFINERY- - - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO MARKET- - - - - - - - -     46.000      46.000      46.000      46.000      46.000      46.000      46.000      46.000      46.000
   PRICE/UNIT RECOVERED- - - - -     415.00      415.00      415.00      415.00      415.00      415.00      415.00      415.00      415.00
   UNITS RECOVERED - - - - - - -         0.          0.     176880.     294800.     353760.     353760.     353760.     353760.     353760.
   REVENUES- - - - - - - - - - -         0.          0.   73405168.  122341968.  146810368.  146810368.  146810368.  146810368.  146810368.
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    DEPLETION - - - - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
    SEVERANCE TAX - - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
    ROYALTY PAYMENT - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.

FINANCIAL SUMMARY  * * * * * *

CASH FLOW
    EXPENSED EXPLORATION +
    TOTAL REVENUES- - - - - - -          0.         0. 290215168. 483691776. 580430336. 580430336. 580430336. 580430336. 580430336.
    LESS MINE OPERATING COSTS -          0.         0.  46500000.  77500000.  93000000.  93000000.  93000000.  93000000.  93000000.
    LESS TRAN OPERATING COSTS -          0.         0.  13244999.  22074992.  26489984.  26489984.  26489984.  26489984.  26489984.
    LESS PROCESS OPERATING COSTS         0.         0. 185294992. 308824832. 370589952. 370589952. 370589952. 370589952. 370589952.
    LESS TRANS TO MARKET- - - -          0.         0.   9097370.  15162286.  18194736.  18194736.  18194736.  18194736.  18194736.
    LESS EXPLORATION COSTS- - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
    LESS DEVELOPMENT COSTS- - -          0.         0.   3920610.   6534350.   7841220.   7841220.   7841220.   7841220.   7841220.
    LESS LOAN INT. PAYMENTS - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
    LESS DEPRECIATION - - - - -          0.         0.         0.  31494992.  55720000.  75150000.  94580000. 112610000. 125850000.
    LESS TOTAL ROYALTY PAYMENTS-         0.         0.         0.         0.         0.         0.         0.         0.         0.

    EQUALS NET INCOME - - - - -          0.         0.  32157216.  22100736.   8594944. -10834944. -30265088. -48294912. -61534976.

    PLUS DEPRECIATION - - - - -          0.         0.         0.  31494992.  55720000.  75150000.  94580000. 112610000. 125850000.
    PLUS TOTAL DEPLETION USED -          0.         0.         0.         0.         0.         0.         0.         0.         0.
    PLUS DEFFERED DEDUCTIONS- -          0.         0.   3920610.   6534350.   7841220.   7841220.   7841220.   7841220.   7841220.
    LESS EQUITY INVESTMENT- - -  227450000. 209350000. 554499584.         0.         0.         0.         0.         0.         0.

    EQUALS CASH FLOW- - - - - - -227450000.-209350000.-518421504.  60130064.  72156160.  72156272.  72156128.  72156304.  72156240.

 ANALYSIS FIGURES
    CONTINUOUS RATE OF RETURN -        0.0        0.0        0.0     -90.000    -90.000    -40.000    -40.000    -31.242    -24.391
    NOTE - * INDICATES THAT A DUAL RATE OF RETURN EXISTED IN THAT YEAR
     18.00 PCT PRESENT VALUE- - -295846912.-327516416.-393021952.-386676712.-380314624.-375001344.-370563328.-366856448.-363760128.
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                                        19         20         21         22         23         24         25         26         27
GENERAL DATA * * * * * * * * * *

INVESTMENTS
   EXPLORATION - - - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   LAND ACQUISITION- - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   RESEACH & DEVELOPMENT,- - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   INVEST. NUMBER 1- MINE- - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
      LIFE - - - - - - - - - -           0          0          0          0          0          0          0          0          0
      DEPRECIATION - - - - - -   31220000.  31220000.  31220000.  31220000.  19160000.  14370000.   9580000.   4790000.         0.
      SALVAGE VALUE- - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   INVEST. NUMBER 2- TRAN- - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
      LIFE - - - - - - - - - -           0          0          0          0          0          0          0          0          0
      DEPRECIATION - - - - - -    8560000.   8560000.   8560000.   8560000.   5680000.   2800000.   1400000.         0.         0.
      SALVAGE VALUE- - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   INVEST. NUMBER 4- PROC- - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
      LIFE - - - - - - - - - -           0          0          0          0          0          0          0          0          0
      DEPRECIATION - - - - - -    4420000.   4420000.   4420000.   4420000.   2210000.         0.         0.         0.         0.
      SALVAGE VALUE- - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   INVEST. NUMBER 5- PROC- - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
      LIFE - - - - - - - - - -           0          0          0          0          0          0          0          0          0
      DEPRECIATION - - - - - -    2210000.   2210000.   2210000.   2210000.   1105000.         0.         0.         0.         0.
      SALVAGE VALUE- - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   INVEST. NUMBER 6- PROC- - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
      LIFE - - - - - - - - - -           0          0          0          0          0          0          0          0          0
      DEPRECIATION - - - - - -   79440000.  79440000.  79440000.  79440000.  66200000.  52960000.  39720000.  26480000.  13240000.
      SALVAGE VALUE- - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   EQUITY CAPITAL- - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   WORKING CAPITAL - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.

OPERATING COSTS PER UNIT

   MINE- - - - - - - - - - - -    31.00000   31.00000   31.00000   31.00000   31.00000   31.00000   31.00000   31.00000   31.00000
   TRANSPORT - - - - - - - - -     8.83000    8.83000    8.83000    8.83000    8.83000    8.83000    8.83000    8.83000    8.83000
   PROCESS - - - - - - - - - -   123.53000  123.53000  123.53000  123.53000  123.53000  123.53000  123.53000  123.53000  123.53000
UNITS TREATED- - - - - - - - -    3000000.   3000000.   3000000.   3000000.   3000000.   3000000.   3000000.   3000000.   3000000.
MISC. OPERATING EXPENSES - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.

COMMODITY DATA * * * * * * * * *

COBALT
   ORE GRADE - - - - - - - - -    0.002600   0.002600   0.002600   0.002600   0.002600   0.002600   0.002600   0.002600   0.002600
   MILL RECOVERY - - - - - - -    0.650000   0.650000   0.650000   0.650000   0.650000   0.650000   0.650000   0.650000   0.650000
   MILL CONCENTRATE GRADE- - -      1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
   SMELTER RECOVERY- - - - - -    1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
   SMELTER CONCENTRATE GRADE -       1.000      1.000      1.000      1.000      1.000      1.000      1.000      1.000      1.000
   REFINER RECOVERY- - - - - -    1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - -      0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
      REFINER- - - - - - - - -      0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - -       0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
      TO REFINERY- - - - - - -       0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
      TO MARKET- - - - - - - -      46.000     46.000     46.000     46.000     46.000     46.000     46.000     46.000     46.000
   PRICE/UNIT RECOVERED- - - -    25740.00   25740.00   25740.00   25740.00   25740.00   25740.00   25740.00   25740.00   25740.00
   UNITS RECOVERED - - - - - -       5070.      5070.      5070.      5070.      5070.      5070.      5070.      5070.      5070.
   REVENUES- - - - - - - - - -  130501696. 130501696. 130501696. 130501696. 130501696. 130501696. 130501696. 130501696. 130501696.
   DEPLETION - - - - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
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  SEVERANCE TAX - - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
  ROYALTY PAYMENT - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.

COPPER
  ORE GRADE - - - - - - - - - -  0.010400   0.010400   0.010400   0.010400   0.010400   0.010400   0.010400   0.010400   0.010400
  MILL RECOVERY - - - - - - - -  0.920000   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000
  MILL CONCENTRATE GRADE- - -      1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
  SMELTER RECOVERY- - - - - -    1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
  SMELTER CONCENTRATE GRADE -       1.000      1.000      1.000      1.000      1.000      1.000      1.000      1.000      1.000
  REFINER RECOVERY- - - - - -    1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
  OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - -     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
      REFINER- - - - - - - - -     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
  TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - -      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
      TO REFINERY- - - - - - -      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
      TO MARKET- - - - - - - -        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
  PRICE/UNIT RECOVERED- - - -     1410.00    1410.00    1410.00    1410.00    1410.00    1410.00    1410.00    1410.00    1410.00
  UNITS RECOVERED - - - - - -      28704.     28704.     28704.     28704.     28704.     28704.     28704.     28704.     28704.
  REVENUES- - - - - - - - - -   40472640.  40472640.  40472640.  40472640.  40472640.  40472640.  40472640.  40472640.  40472640.
  DEPLETION - - - - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
  SEVERANCE TAX - - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
  ROYALTY PAYMENT - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.

NICKEL
  ORE GRADE - - - - - - - - - -  0.013300   0.013300   0.013300   0.013300   0.013300   0.013300   0.013300   0.013300   0.013300
  MILL RECOVERY - - - - - - - -  0.920000   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000
  MILL CONCENTRATE GRADE- - -      1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
  SMELTER RECOVERY- - - - - -    1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
  SMELTER CONCENTRATE GRADE -       1.000      1.000      1.000      1.000      1.000      1.000      1.000      1.000      1.000
  REFINER RECOVERY- - - - - -    1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
  OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - -     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
      REFINER- - - - - - - - -     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
  TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - -      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
      TO REFINERY- - - - - - -      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
      TO MARKET- - - - - - - -     46.000     46.000     46.000     46.000     46.000     46.000     46.000     46.000     46.000
  PRICE/UNIT RECOVERED- - - -     7155.00    7155.00    7155.00    7155.00    7155.00    7155.00    7155.00    7155.00    7155.00
  UNITS RECOVERED - - - - - -      36708.     36708.     36708.     36708.     36708.     36708.     36708.     36708.     36708.
  REVENUES- - - - - - - - - -  262645760. 262645760. 262645760. 262645760. 262645760. 262645760. 262645760. 262645760. 262645760.
  DEPLETION - - - - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
  SEVERANCE TAX - - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
  ROYALTY PAYMENT - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.

MANGANESE
  ORE GRADE - - - - - - - - - -  0.268000   0.268000   0.268000   0.268000   0.268000   0.268000   0.268000   0.268000   0.268000
  MILL RECOVERY - - - - - - - -  0.440000   0.440000   0.440000   0.440000   0.440000   0.440000   0.440000   0.440000   0.440000
  MILL CONCENTRATE GRADE- - -      1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
  SMELTER RECOVERY- - - - - -    1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
  SMELTER CONCENTRATE GRADE -       1.000      1.000      1.000      1.000      1.000      1.000      1.000      1.000      1.000
  REFINER RECOVERY- - - - - -    1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
  OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - -     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
      REFINER- - - - - - - - -     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
  TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - -      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
      TO REFINERY- - - - - - -      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
      TO MARKET- - - - - - - -     46.000     46.000     46.000     46.000     46.000     46.000     46.000     46.000     46.000
  PRICE/UNIT RECOVERED- - - -      415.00     415.00     415.00     415.00     415.00     415.00     415.00     415.00     415.00
  UNITS RECOVERED - - - - - -     353760.    353760.    353760.    353760.    353760.    353760.    353760.    353760.    353760.
  REVENUES- - - - - - - - - -  146810368. 146810368. 146810368. 146810368. 146810368. 146810368. 146810368. 146810368. 146810368.
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    DEPLETION - - - - - - - - - -         0.         0.         0.         0.         0.         0.         0.         0.         0.
    SEVERANCE TAX - - - - - - - -         0.         0.         0.         0.         0.         0.         0.         0.         0.
    ROYALTY PAYMENT - - - - - - -         0.         0.         0.         0.         0.         0.         0.         0.         0.

FINANCIAL SUMMARY  * * * * * *

CASH FLOW
    EXPENSED EXPLORATION +
    TOTAL REVENUES- - - - - - -  580430336. 580430336. 580430336. 580430336. 580430336. 580430336. 580430336. 580430336. 580430336.
    LESS MINE OPERATING COSTS -   93000000.  93000000.  93000000.  93000000.  93000000.  93000000.  93000000.  93000000.  93000000.
    LESS TRAN OPERATING COSTS -   26489984.  26489984.  26489984.  26489984.  26489984.  26489984.  26489984.  26489984.  26489984.
    LESS PROCESS OPERATING COSTS 370589952. 370589952. 370589952. 370589952. 370589952. 370589952. 370589952. 370589952. 370589952.
    LESS TRANS TO MARKET- - - -   18194736.  18194736.  18194736.  18194736.  18194736.  18194736.  18194736.  18194736.  18194736.
    LESS EXPLORATION COSTS- - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
    LESS DEVELOPMENT COSTS- - -    7841220.   7841220.   7841220.   7841220.   7841220.   7841220.   7841220.   7841220.   7841220.
    LESS LOAN INT. PAYMENTS - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
    LESS DEPRECIATION - - - - -  125850000. 125850000. 125850000. 125850000.  94354992.  70130000.  50700000.  31270000.  13240000.
    LESS TOTAL ROYALTY PAYMENTS-         0.         0.         0.         0.         0.         0.         0.         0.         0.

    EQUALS NET INCOME - - - - -  -61534976. -61534976. -61534976. -61534976. -30040064.  -5815040.  13615104.  33044992.  51075072.

    PLUS DEPRECIATION - - - - -  125850000. 125850000. 125850000. 125850000.  94354992.  70130000.  50700000.  31270000.  13240000.
    PLUS TOTAL DEPLETION USED -          0.         0.         0.         0.         0.         0.         0.         0.         0.
    PLUS DEFFERED DEDUCTIONS- -    7841220.   7841220.   7841220.   7841220.   7841220.   7841220.   7841220.   7841220.   7841220.
    LESS EQUITY INVESTMENT- - -          0.         0.         0.         0.         0.         0.         0.         0.         0.

    EQUALS CASH FLOW- - - - - -   72156240.  72156240.  72156240.  72156240.  72156144.  72156176.  72156320.  72156208.  72156288.

ANALYSIS FIGURES
    CONTINUOUS RATE OF RETURN -     -19.538    -15.927    -13.142    -10.934     -9.145     -7.672     -6.439     -5.396     -4.505
    NOTE - * INDICATES THAT A DUAL RATE OF RETURN EXISTED IN THAT YEAR
     18.00 PCT PRESENT VALUE- - -361173760.-359013376.-357208832.-355701504.-354442496.-353390848.-352512512.-351778816.-351165952.
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                                     28          29          30          31          32          33          34

GENERAL DATA * * * * * * * * *

INVESTMENTS
   EXPLORATION - - - - - - - -        0.          0.          0.          0.          0.          0.          0.
   LAND ACQUISITION- - - - - -        0.          0.          0.          0.          0.          0.          0.
   RESEACH & DEVELOPMENT.- - -        0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 1- MINE- - -        0.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - -         0           0           0           0           0           0           0
      DEPRECIATION - - - - - -        0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -        0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 2- TRAN- - -        0.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - -         0           0           0           0           0           0           0
      DEPRECIATION - - - - - -        0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -        0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 4- PROC- - -        0.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - -         0           0           0           0           0           0           0
      DEPRECIATION - - - - - -        0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -        0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 5- PROC- - -        0.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - -         0           0           0           0           0           0           0
      DEPRECIATION - - - - - -        0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -        0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 6- PROC- - -        0.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - -         0           0           0           0           0           0           0
      DEPRECIATION - - - - - -        0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -        0.          0.          0.          0.          0.          0.          0.
   EQUITY CAPITAL- - - - - - -        0.          0.          0.          0.          0.          0.          0.
   WORKING CAPITAL - - - - - -        0.          0.          0.          0.          0.          0.          0.

OPERATING COSTS PER UNIT

   MINE- - - - - - - - - - - -  31.00000    31.00000    31.00000    31.00000    31.00000    28.89999     3.33000
   TRANSPORT - - - - - - - - -   8.83000     8.83000     8.83000     8.83000     8.83000     8.83000     0.80000
   PROCESS - - - - - - - - - - 123.53000   123.53000   123.53000   123.53000   123.53000   123.53000    11.80000
UNITS TREATED- - - - - - - - -  3000000.    3000000.    3000000.    3000000.    3000000.    3000000.    1500000.
MISC. OPERATING EXPENSES - - -        0.          0.          0.          0.          0.          0.          0.

COMMODITY DATA * * * * * * * *

COBALT
   ORE GRADE - - - - - - - - -  0.002600    0.002600    0.002600    0.002600    0.002600    0.002600    0.002600
   MILL RECOVERY - - - - - - -  0.650000    0.650000    0.650000    0.650000    0.650000    0.650000    0.650000
   MILL CONCENTRATE GRADE- - -    1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
   SMELTER RECOVERY- - - - - -  1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   SMELTER CONCENTRATE GRADE -     1.000       1.000       1.000       1.000       1.000       1.000       1.000
   REFINER RECOVERY- - - - - -  1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - -    0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
      REFINER- - - - - - - - -    0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - -     0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO REFINERY- - - - - - -     0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO MARKET- - - - - - - -    46.000      46.000      46.000      46.000      46.000      46.000      46.000
   PRICE/UNIT RECOVERED- - - -  25740.00    25740.00    25740.00    25740.00    25740.00    25740.00    25740.00
   UNITS RECOVERED - - - - - -     5070.       5070.       5070.       5070.       5070.       5070.       2535.
   REVENUES- - - - - - - - - - 130501696.  130501696.  130501696.  130501696.  130501696.  130501696.   65250880.
   DEPLETION - - - - - - - - -        0.          0.          0.          0.          0.          0.          0.
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  SEVERANCE TAX - - - - - - -          0.         0.         0.         0.         0.         0.         0.
  ROYALTY PAYMENT - - - - - -          0.         0.         0.         0.         0.         0.         0.

COPPER
  ORE GRADE - - - - - - - - -   0.010400   0.010400   0.010400   0.010400   0.010400   0.010400   0.010400
  MILL RECOVERY - - - - - - -   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000
  MILL CONCENTRATE GRADE- - -     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
  SMELTER RECOVERY- - - - - -   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
  SMELTER CONCENTRATE GRADE -      1.000      1.000      1.000      1.000      1.000      1.000      1.000
  REFINER RECOVERY- - - - - -   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
  OP. COSTS/UNIT PROCESSED
     SMELTER- - - - - - - - -     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
     REFINER- - - - - - - - -     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
  TRANS. COSTS/UNIT PROCESSED
     TO SMELTER - - - - - - -      0.000      0.000      0.000      0.000      0.000      0.000      0.000
     TO REFINERY- - - - - - -      0.000      0.000      0.000      0.000      0.000      0.000      0.000
     TO MARKET- - - - - - - -        0.0        0.0        0.0        0.0        0.0        0.0        0.0
  PRICE/UNIT RECOVERED- - - -    1410.00    1410.00    1410.00    1410.00    1410.00    1410.00    1410.00
  UNITS RECOVERED - - - - - -     28704.     28704.     28704.     28704.     28704.     28704.     14352.
  REVENUES- - - - - - - - - -  40472640.  40472640.  40472640.  40472640.  40472640.  40472640.  20236320.
  DEPLETION - - - - - - - - -         0.         0.         0.         0.         0.         0.         0.
  SEVERANCE TAX - - - - - - -         0.         0.         0.         0.         0.         0.         0.
  ROYALTY PAYMENT - - - - - -         0.         0.         0.         0.         0.         0.         0.

NICKEL
  ORE GRADE - - - - - - - - -   0.013300   0.013300   0.013300   0.013300   0.013300   0.013300   0.013300
  MILL RECOVERY - - - - - - -   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000   0.920000
  MILL CONCENTRATE GRADE- - -     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
  SMELTER RECOVERY- - - - - -   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
  SMELTER CONCENTRATE GRADE -      1.000      1.000      1.000      1.000      1.000      1.000      1.000
  REFINER RECOVERY- - - - - -   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
  OP. COSTS/UNIT PROCESSED
     SMELTER- - - - - - - - -     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
     REFINER- - - - - - - - -     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
  TRANS. COSTS/UNIT PROCESSED
     TO SMELTER - - - - - - -      0.000      0.000      0.000      0.000      0.000      0.000      0.000
     TO REFINERY- - - - - - -      0.000      0.000      0.000      0.000      0.000      0.000      0.000
     TO MARKET- - - - - - - -     46.000     46.000     46.000     46.000     46.000     46.000     46.000
  PRICE/UNIT RECOVERED- - - -    7155.00    7155.00    7155.00    7155.00    7155.00    7155.00    7155.00
  UNITS RECOVERED - - - - - -     36708.     36708.     36708.     36708.     36708.     36708.     18354.
  REVENUES- - - - - - - - - - 262645760. 262645760. 262645760. 262645760. 262645760. 262645760. 131322864.
  DEPLETION - - - - - - - - -         0.         0.         0.         0.         0.         0.         0.
  SEVERANCE TAX - - - - - - -         0.         0.         0.         0.         0.         0.         0.
  ROYALTY PAYMENT - - - - - -         0.         0.         0.         0.         0.         0.         0.

MANGANESE
  ORE GRADE - - - - - - - - -   0.268000   0.268000   0.268000   0.268000   0.268000   0.268000   0.268000
  MILL RECOVERY - - - - - - -   0.440000   0.440000   0.440000   0.440000   0.440000   0.440000   0.440000
  MILL CONCENTRATE GRADE- - -     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
  SMELTER RECOVERY- - - - - -   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
  SMELTER CONCENTRATE GRADE -      1.000      1.000      1.000      1.000      1.000      1.000      1.000
  REFINER RECOVERY- - - - - -   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000   1.000000
  OP. COSTS/UNIT PROCESSED
     SMELTER- - - - - - - - -     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
     REFINER- - - - - - - - -     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
  TRANS. COSTS/UNIT PROCESSED
     TO SMELTER - - - - - - -      0.000      0.000      0.000      0.000      0.000      0.000      0.000
     TO REFINERY- - - - - - -      0.000      0.000      0.000      0.000      0.000      0.000      0.000
     TO MARKET- - - - - - - -     46.000     46.000     46.000     46.000     46.000     46.000     46.000
  PRICE/UNIT RECOVERED- - - -     415.00     415.00     415.00     415.00     415.00     415.00     415.00
  UNITS RECOVERED - - - - - -    353760.    353760.    353760.    353760.    353760.    353760.    176880.
  REVENUES- - - - - - - - - - 146810368. 146810368. 146810368. 146810368. 146810368. 146810368.  73405168.
```

/...

```
   DEPLETION - - - - - - - - -          0.         0.         0.         0.         0.         0.         0.
   SEVERANCE TAX - - - - - - -          0.         0.         0.         0.         0.         0.         0.
   ROYALTY PAYMENT - - - - - -          0.         0.         0.         0.         0.         0.         0.

FINANCIAL SUMMARY  * * * * * *

CASH FLOW
   EXPENSED EXPLORATION +
   TOTAL REVENUES- - - - - - -  580430336. 580430336. 580430336. 580430336. 580430336. 580430336. 290215168.
   LESS MINE OPERATING COSTS -   93000000.  93000000.  93000000.  93000000.  93000000.  86699968.   4994999.
   LESS TRAN OPERATING COSTS -   26489984.  26489984.  26489984.  26489984.  26489984.  26489984.   1200000.
   LESS PROCESS OPERATING COSTS 370589952. 370589952. 370589952. 370589952. 370589952. 370589952.  17700000.
   LESS TRANS TO MARKET- - - -   18194736.  18194736.  18194736.  18194736.  18194736.  18194736.   9097370.
   LESS EXPLORATION COSTS- - -          0.         0.         0.         0.         0.         0.         0.
   LESS DEVELOPMENT COSTS- - -    7841220.   7841220.   7841220.   7841220.   7841220.   7841220.   3920610.
   LESS LOAN INT. PAYMENTS - -          0.         0.         0.         0.         0.         0.         0.
   LESS DEPRECIATION - - - - -          0.         0.         0.         0.         0.         0.         0.
   LESS TOTAL ROYALTY PAYMENTS-         0.         0.         0.         0.         0.         0.         0.

   EQUALS NET INCOME - - - - -   64314880.  64314880.  64314880.  64314880.  64314880.  70614784. 253302192.

   PLUS DEPRECIATION - - - - -          0.         0.         0.         0.         0.         0.         0.
   PLUS TOTAL DEPLETION USED -          0.         0.         0.         0.         0.         0.         0.
   PLUS DEFFERED DEDUCTIONS- -    7841220.   7841220.   7841220.   7841220.   7841220.   7841220.   3920610.
   LESS EQUITY INVESTMENT- - -          0.         0.         0.         0.         0.         0.         0.

   EQUALS CASH FLOW- - - - - -   72156096.  72156096.  72156096.  72156096.  72156096.  78456000. 257222800.

ANALYSIS FIGURES
   CONTINUOUS RATE OF RETURN -      -3.735     -3.066     -2.480     -1.963     -1.506     -1.065      0.066
   NOTE - * INDICATES THAT A DUAL RATE OF RETURN EXISTED IN THAT YEAR
    18.00 PCT PRESENT VALUE- - -350653952.-350226432.-349869312.-349571072.-349321728.-349095424.-348475648.
```

/...

```
                                   SUMMARY DATA

                                   ENTERPRISE EVALUATION -3MILLION TONNES NODULES(DRY) P.A. [CUPRION PROCESS]

                         LAST YEAR ADDITIONS TO CASH FLOW
CUMULATIVE WORKING CAPITAL     334599936.
CUMULATIVE SALVAGE VALUE               0.

                         OTHER CUMULATIVE VALUES
REVENUES                     12672002200.
ROYALTIES                              0.
TOTAL DEPRECIATION            1360490560.
FEDERAL INCOME TAXES                   0.
CASH FLOW                       17558096.

                         LAST YEARS ANALYSIS FIGURES
CONTINUOUS RATE OF RETURN          0.066
 18.00 PCT PRESENT VALUE      -348475648.

               COMMODITY SUMMARY DATA

COMMODITY                REVENUES    UNITS RECOVERED          PRICE/UNIT


COBALT                 3849285630.            110694.          35740.000
COPPER                  883651584.            626704.           1410.000
NICKEL                 5734420480.            801468.           7155.000
MANGANESE              3206359360.           7723740.            415.000

  TOTAL INITIAL INVESTMENT DATA

   ITEM                           AMOUNT

EXPLORATION                    21000000.
LAND ACQUISITION                      0.
RESEARCH & DEVELOPMENT        171200000.
MINE AND TRANS SHIPS          397799680.
PROCESS PLANT AND PORT        860699392.
WORKING CAPITAL               334599936.
MISC INVEST & OP COSTS                0.

TOTAL UNITS TREATED            65500000.
```

/...

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                    BUREAU OF MINERAL RESOURCES OF AUSTRALIA

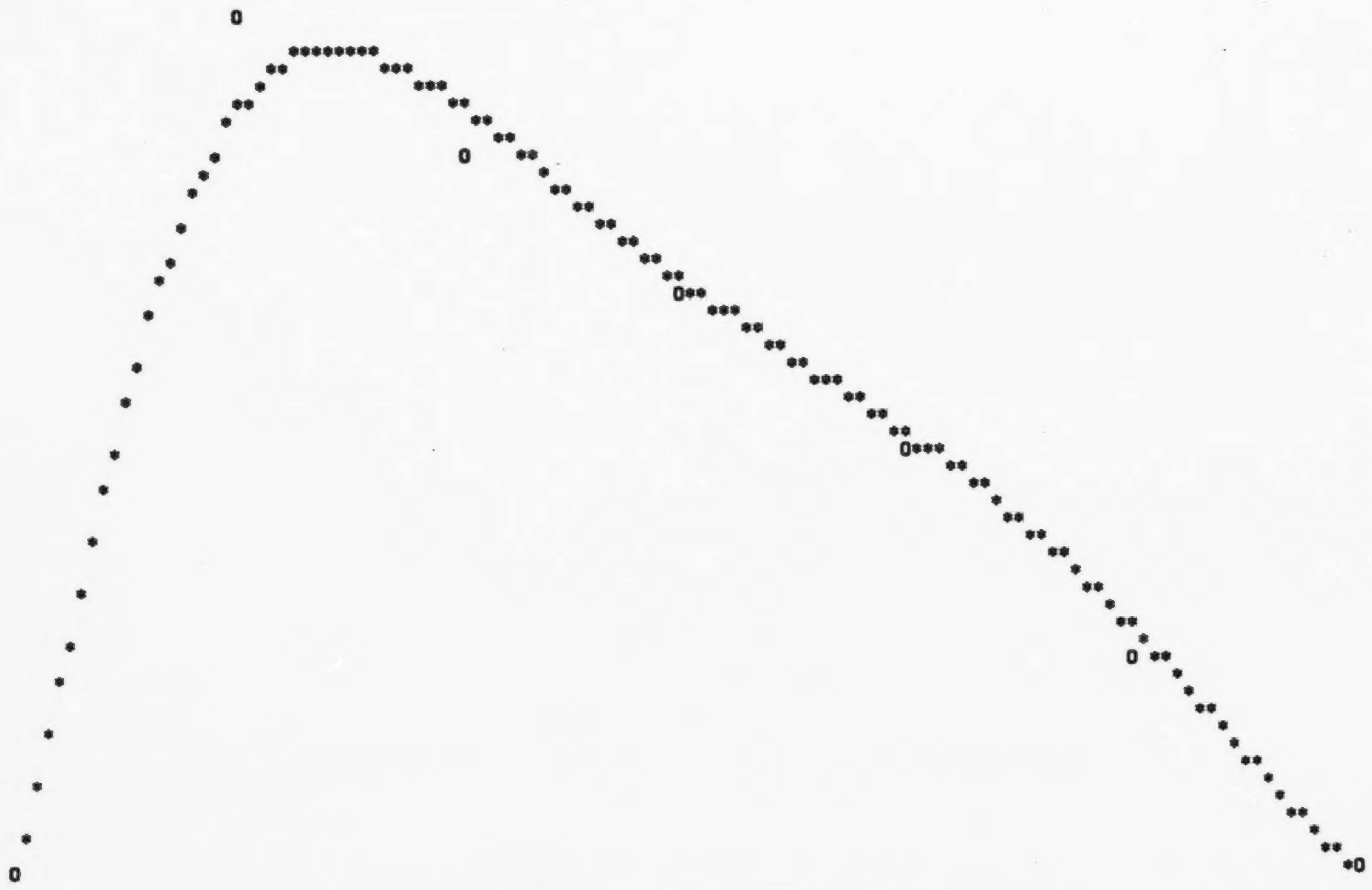

                              FINANCIAL EVALUATION

  ENTERPRISE EVALUATION -3MILLION TONNES NODULES(DRY) P.A. [CUPRION PROCESS]

                         BEGINNING OPERATION IN    1
                         AND ENDING OPERATION IN   34
                         WITH 11 PREPRODUCTION YEARS
                         USING    1 SIMULATION(S) AND
                         A TARGET RATE OF RETURN OF
                             10.0 PERCENT
                     CONTINUOUS DISCOUNTED CASHFLOW IS USED
```

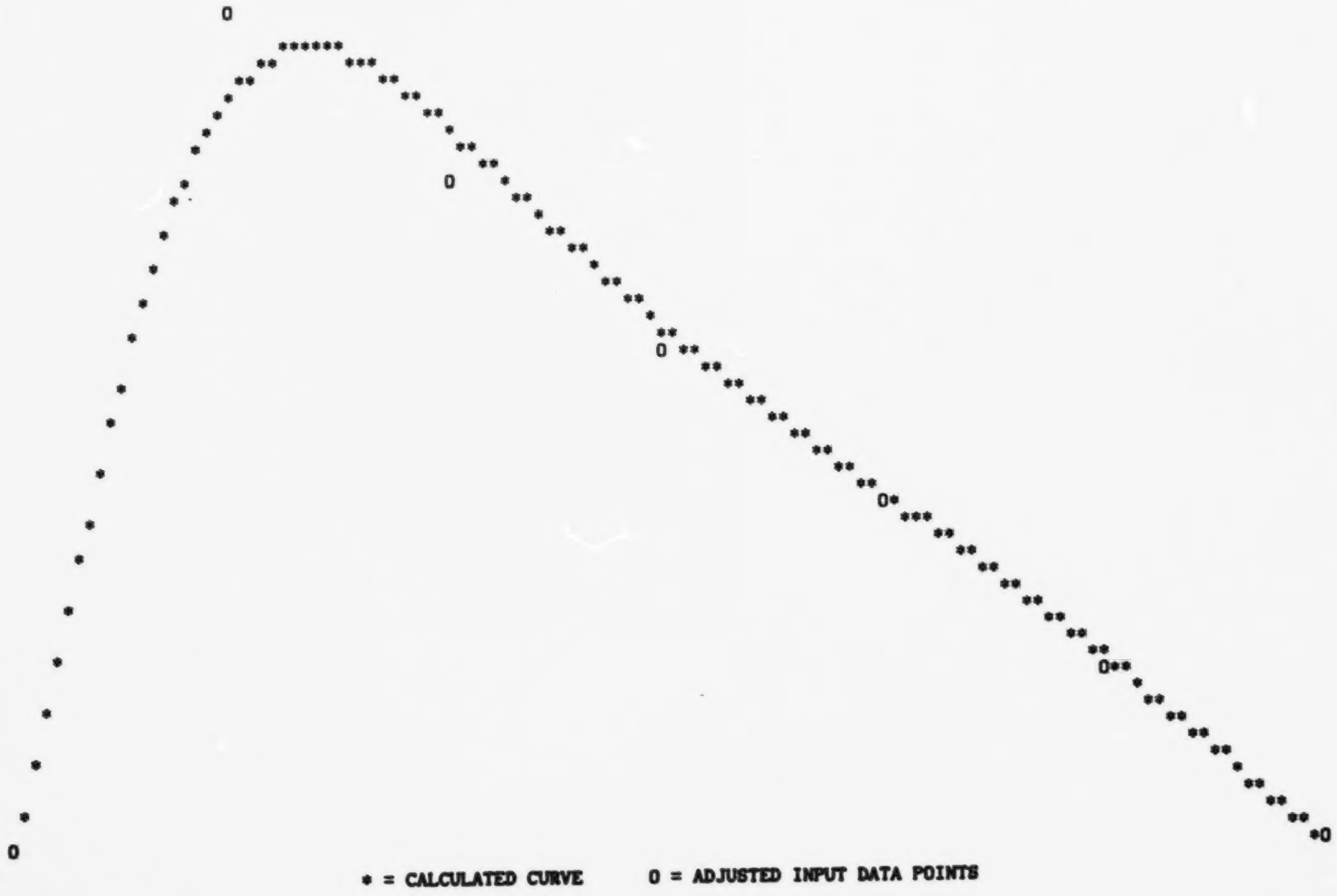
/...

```
                    CATEGORY  1 EXPLORATION           1 TO    6
             COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS
EQUATION COEFICIENTS,  A=    10.4218750 ,  B=    -0.00000171,  C=     2.18872070,  D=    -2.37011719
```



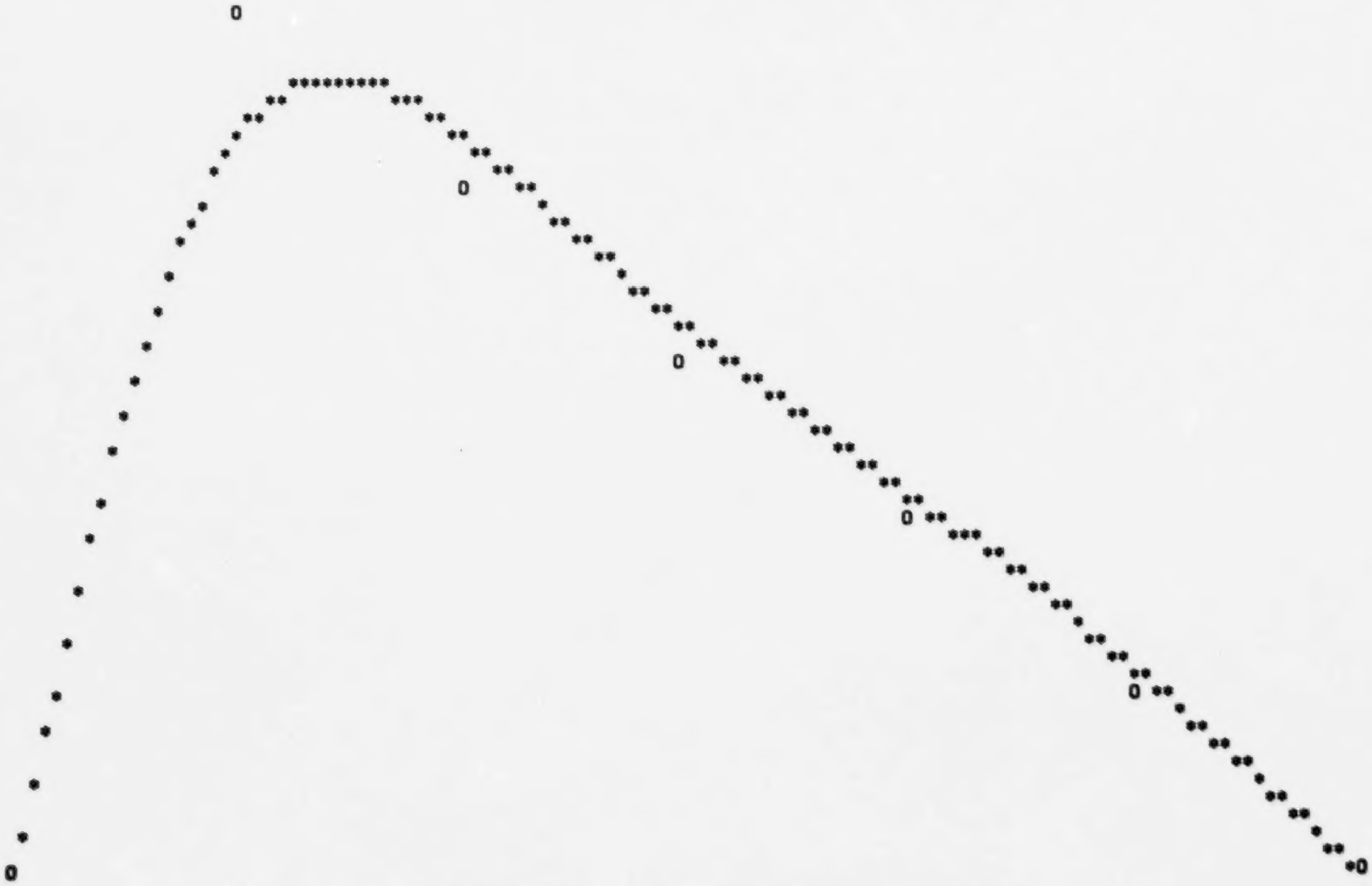
* = CALCULATED CURVE   0 = ADJUSTED INPUT DATA POINTS

```
                    CATEGORY  3 RESEARCH              1 TO    5
               COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS
EQUATION COEFICIENTS,  A=      8.29687500,  B=    -0.00000031,  C=      2.16381836,  D=    -2.23803711
```



/...

```
                    CATEGORY  3 RESEARCH          6 TO    7
             COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS
EQUATION COEFICIENTS,  A=     7.97265625,  B=    -0.00000012,  C=      2.11914062,  D=    -2.19628906
```



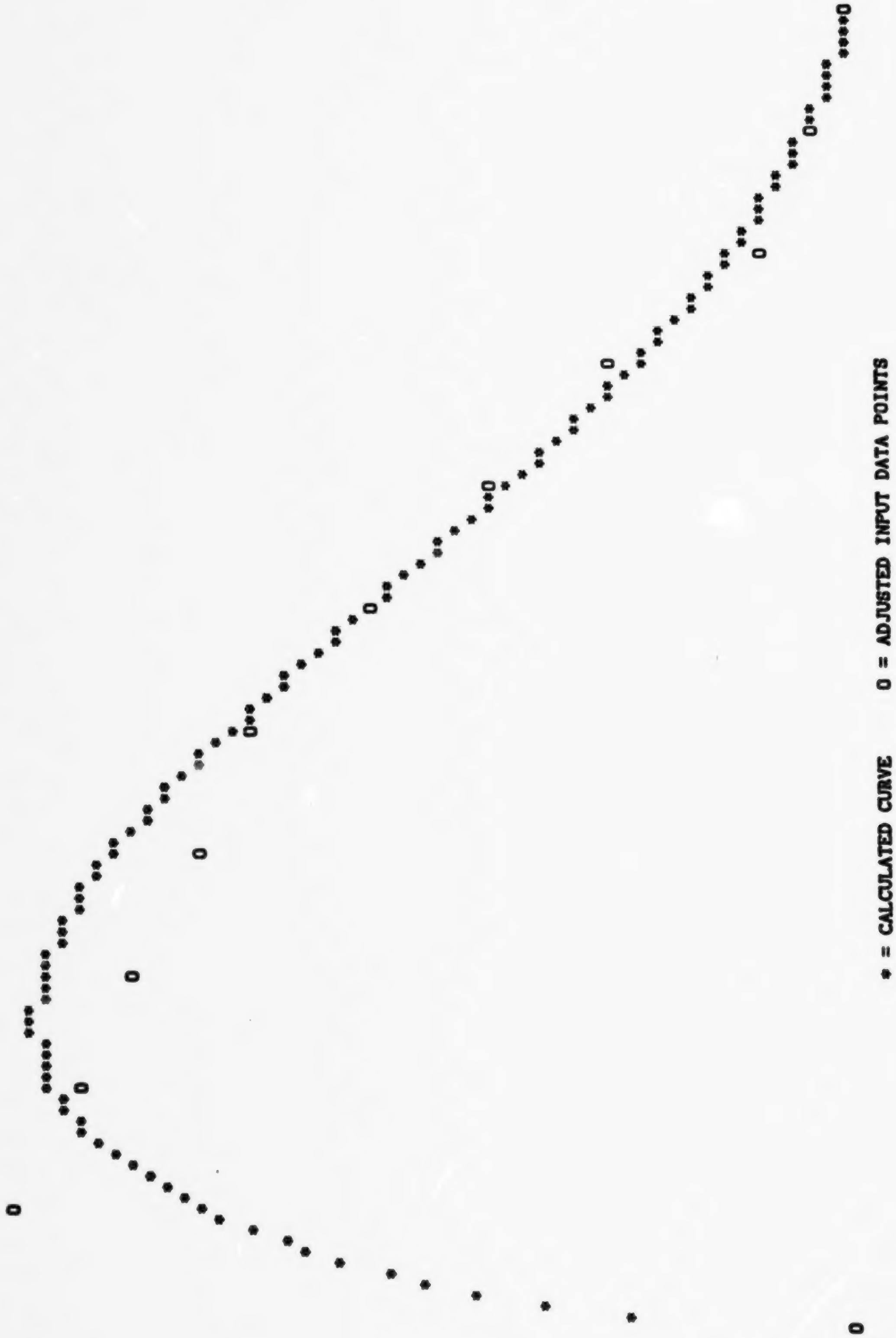
* = CALCULATED CURVE   0 = ADJUSTED INPUT DATA POINTS

/...

CATEGORY 4 MINING CAP 7 TO 11

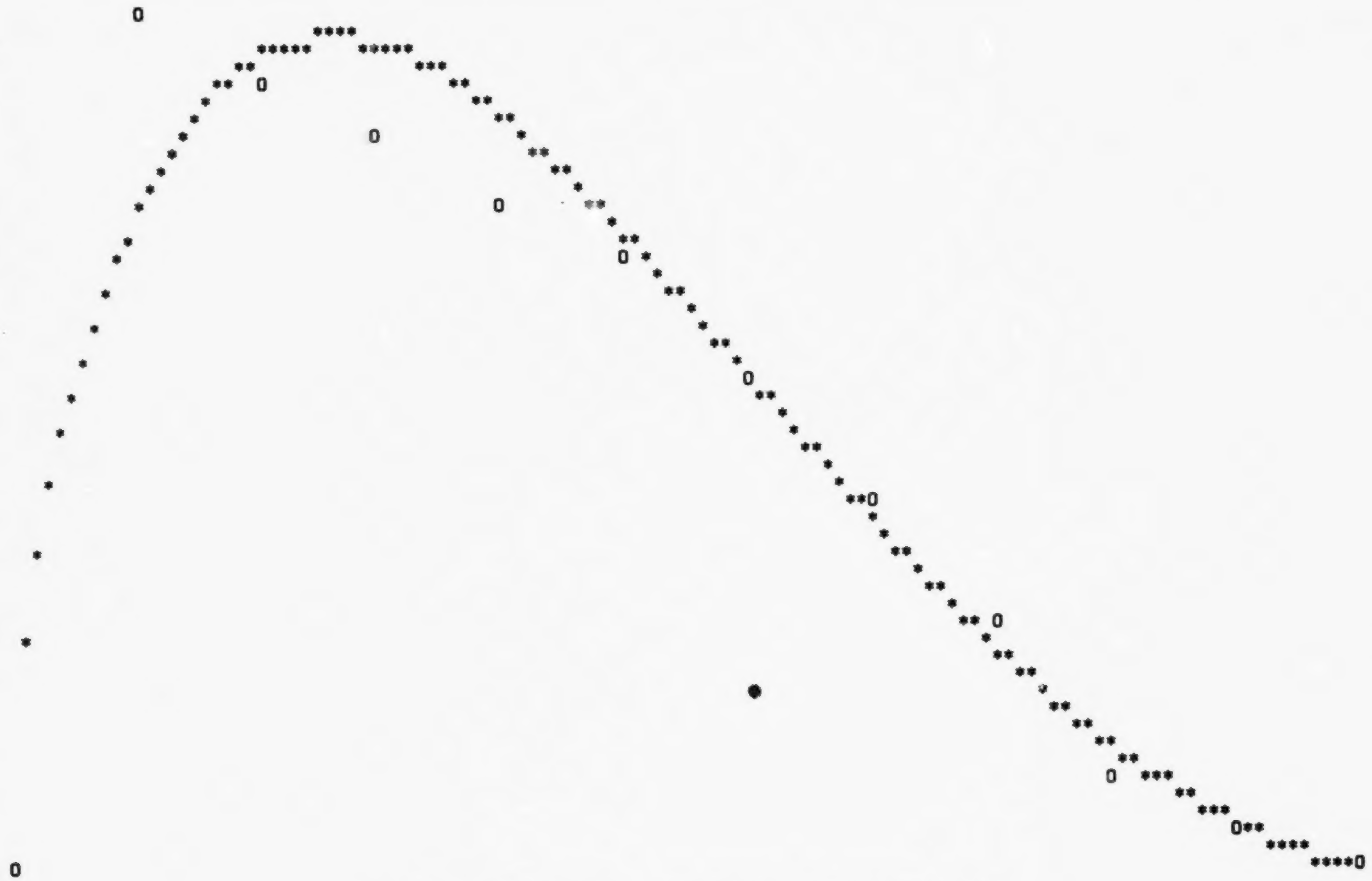
COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS

EQUATION COEFICIENTS. A= 22.2617187 , B= -0.00000003, C= 1.43066406, D= -2.58494141



/...

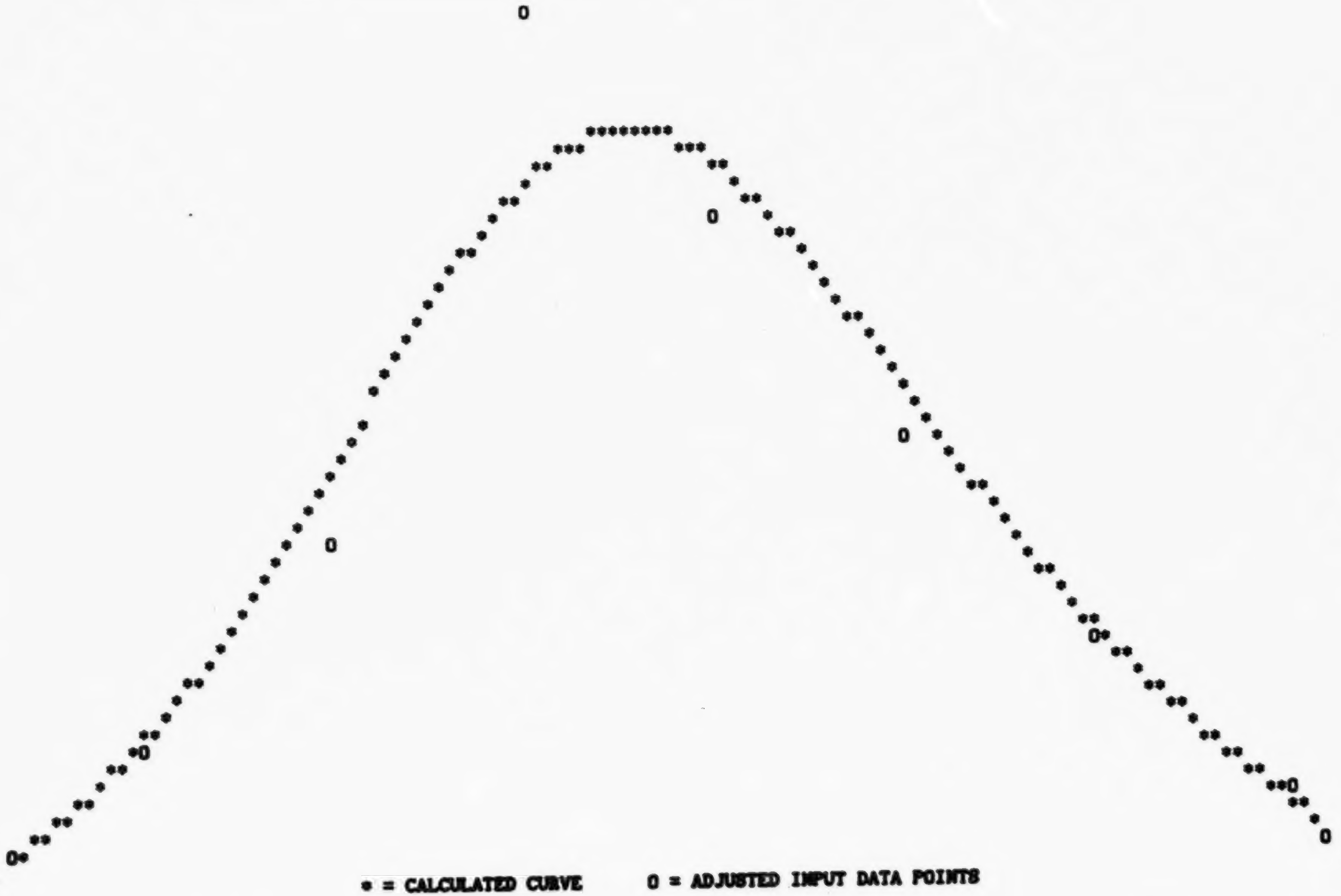
CATEGORY 4 MINING CAP 12 TO 12
COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS
EQUATION COEFICIENTS, A= 22.5781250 , B= -0.00000002, C= 1.43115234, D= -2.55786133



* = CALCULATED CURVE   0 = ADJUSTED INPUT DATA POINTS

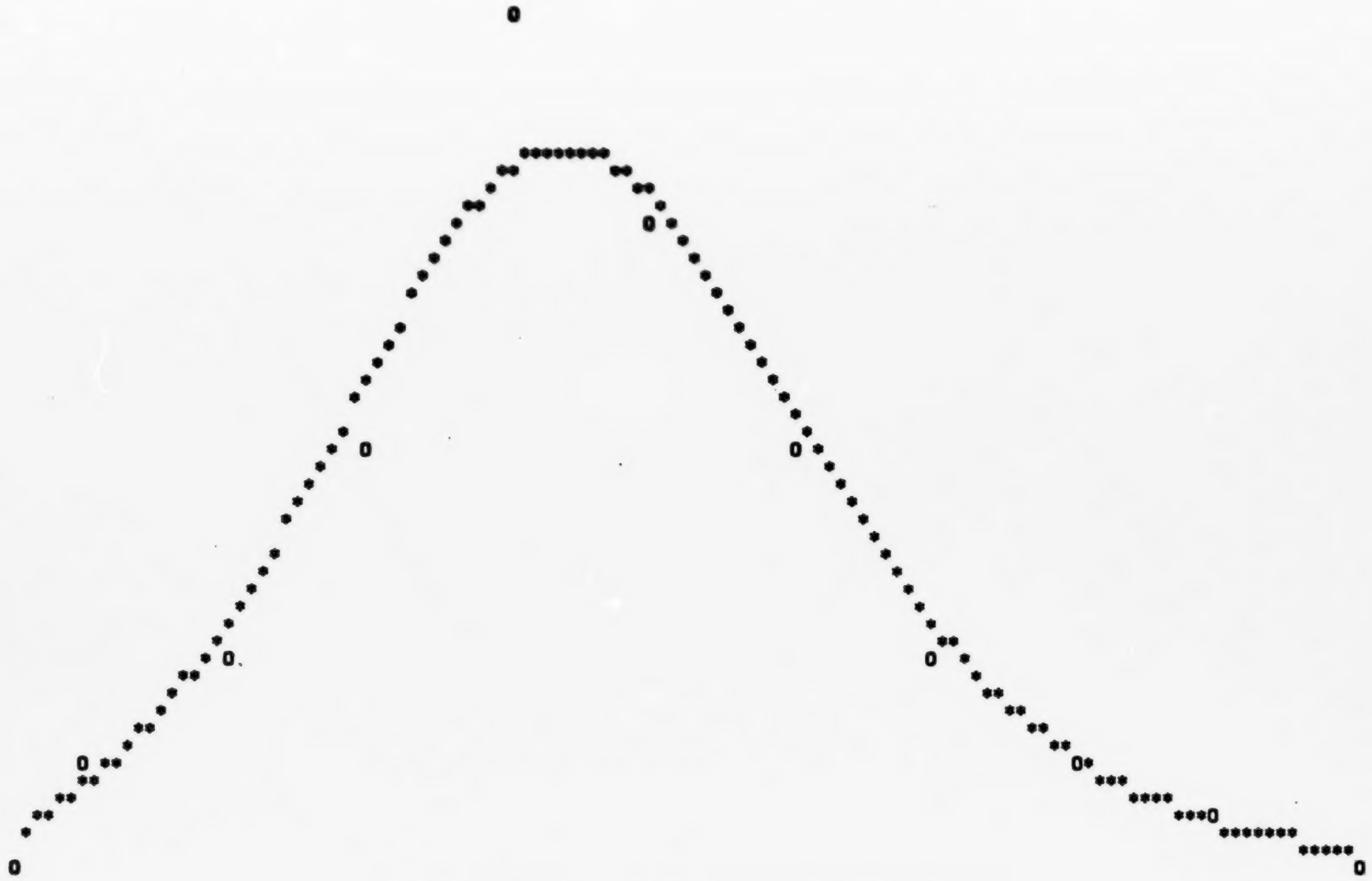
/...

```
                    CATEGORY  7 PROCESS CAP1        9 TO   10
             COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS
EQUATION COEFICIENTS,  A=    -7.82446289,  B=     0.00000003,  C=     2.02705383,  D=    -1.57582092
```



/...

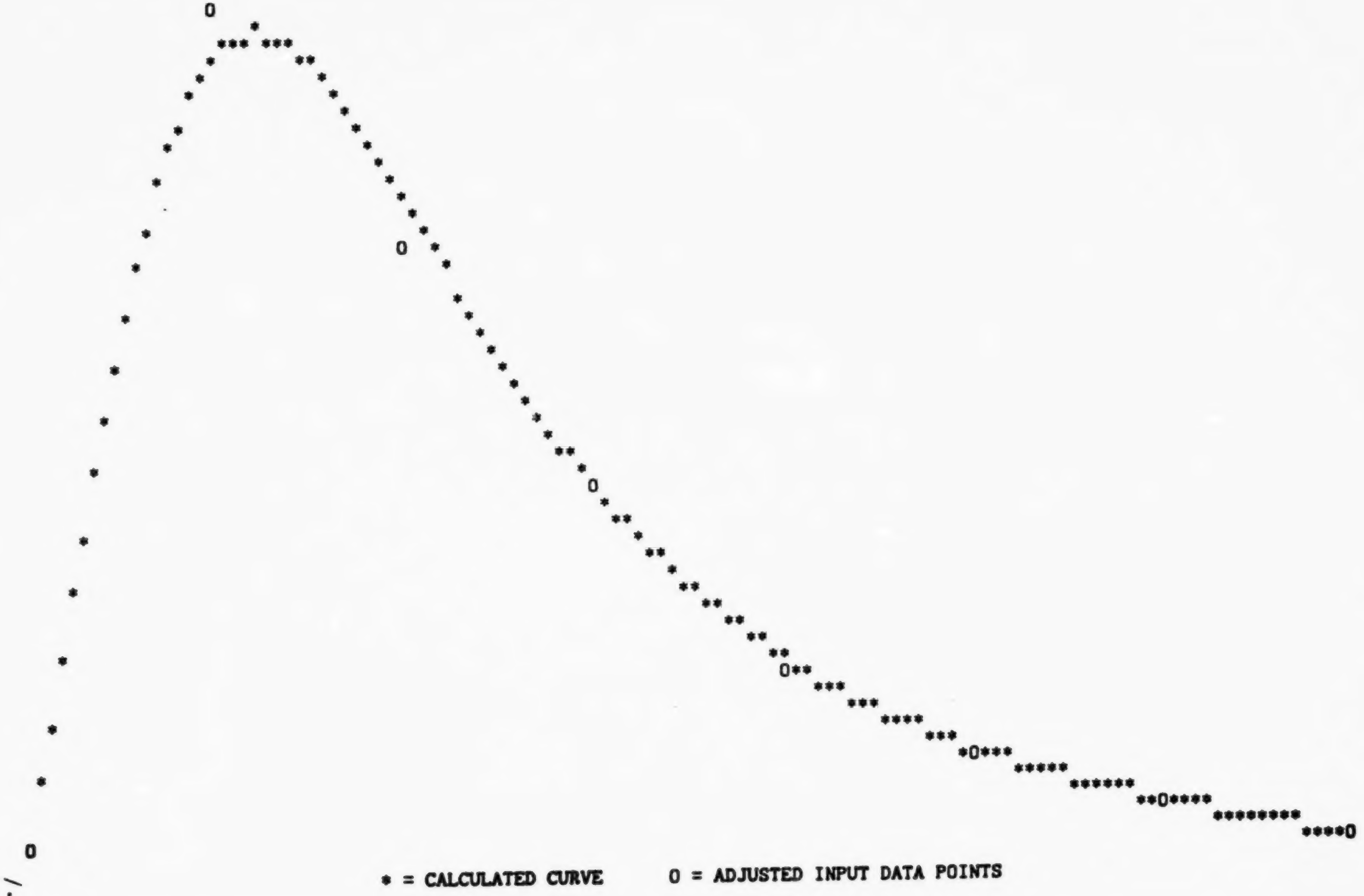
```
                    CATEGORY  8 PROCESS CAP2        10 TO   11
              COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS
EQUATION COEFICIENTS,  A=    -8.07636914,  B=     0.00000039,  C=     1.29109192,  D=    -1.03981018
```



* = CALCULATED CURVE   0 = ADJUSTED INPUT DATA POINTS

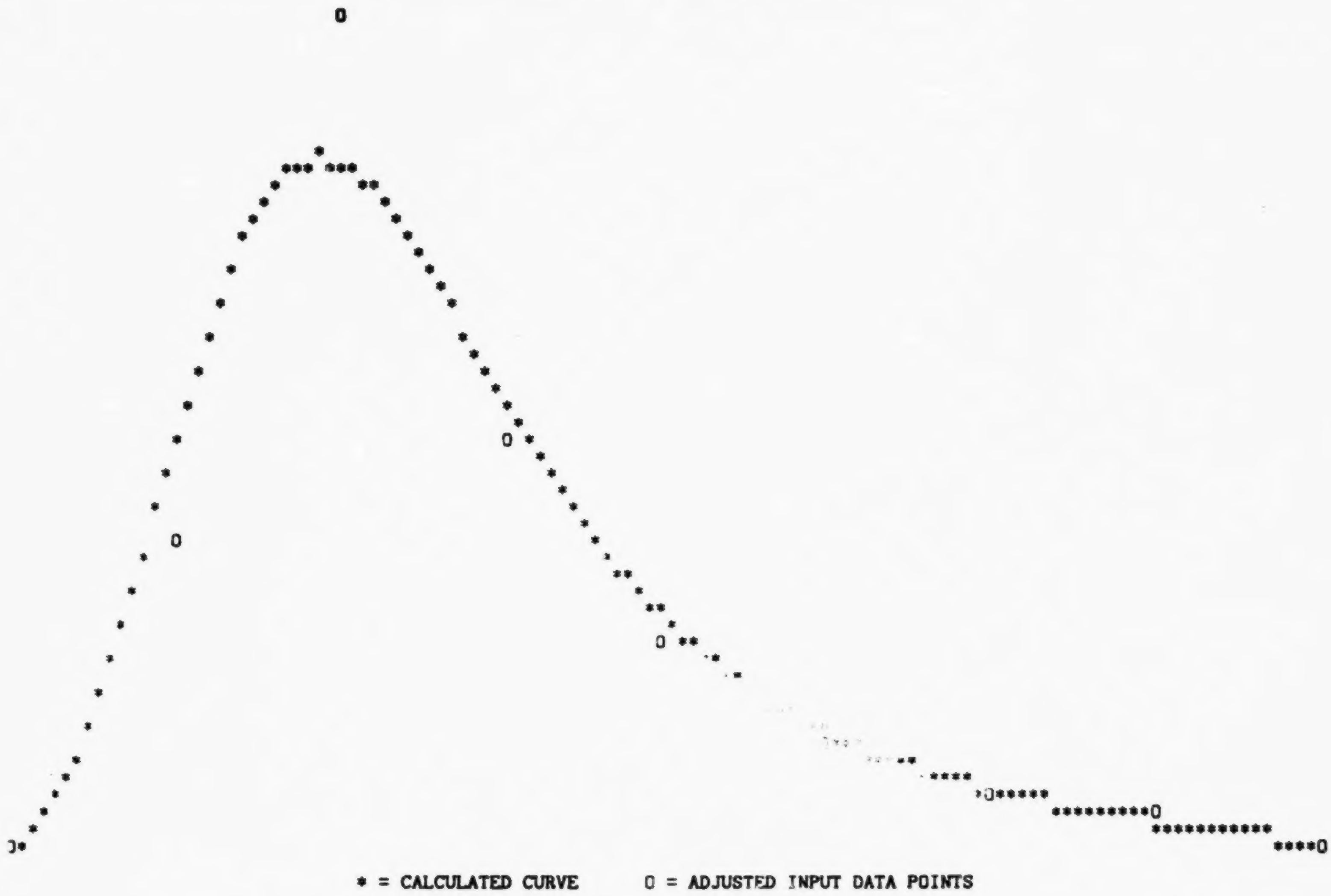
/...

CATEGORY 9 PROCESS CAP3 7 TO 12
COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS
EQUATION COEFICIENTS, A= 3.77734375, B= -0.00000001, C= 1.99438477, D= -1.97265625



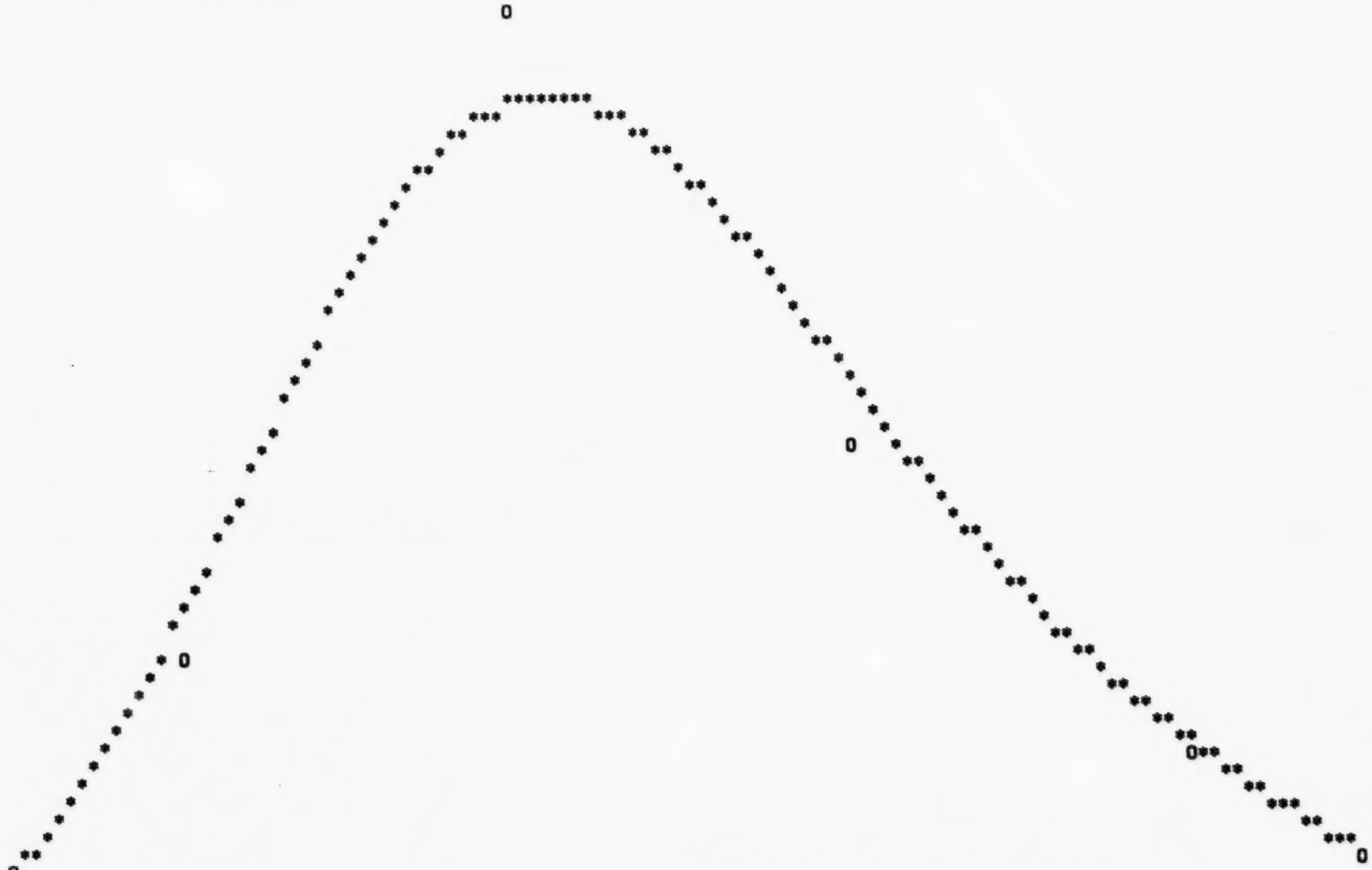
/...

CATEGORY 15 OP COST MINE 12 TO 32
COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS
EQUATION COEFICIENTS, A= 1.31933594, B= -0.06655884, C= 2.80937195, D= -1.65628052



/...

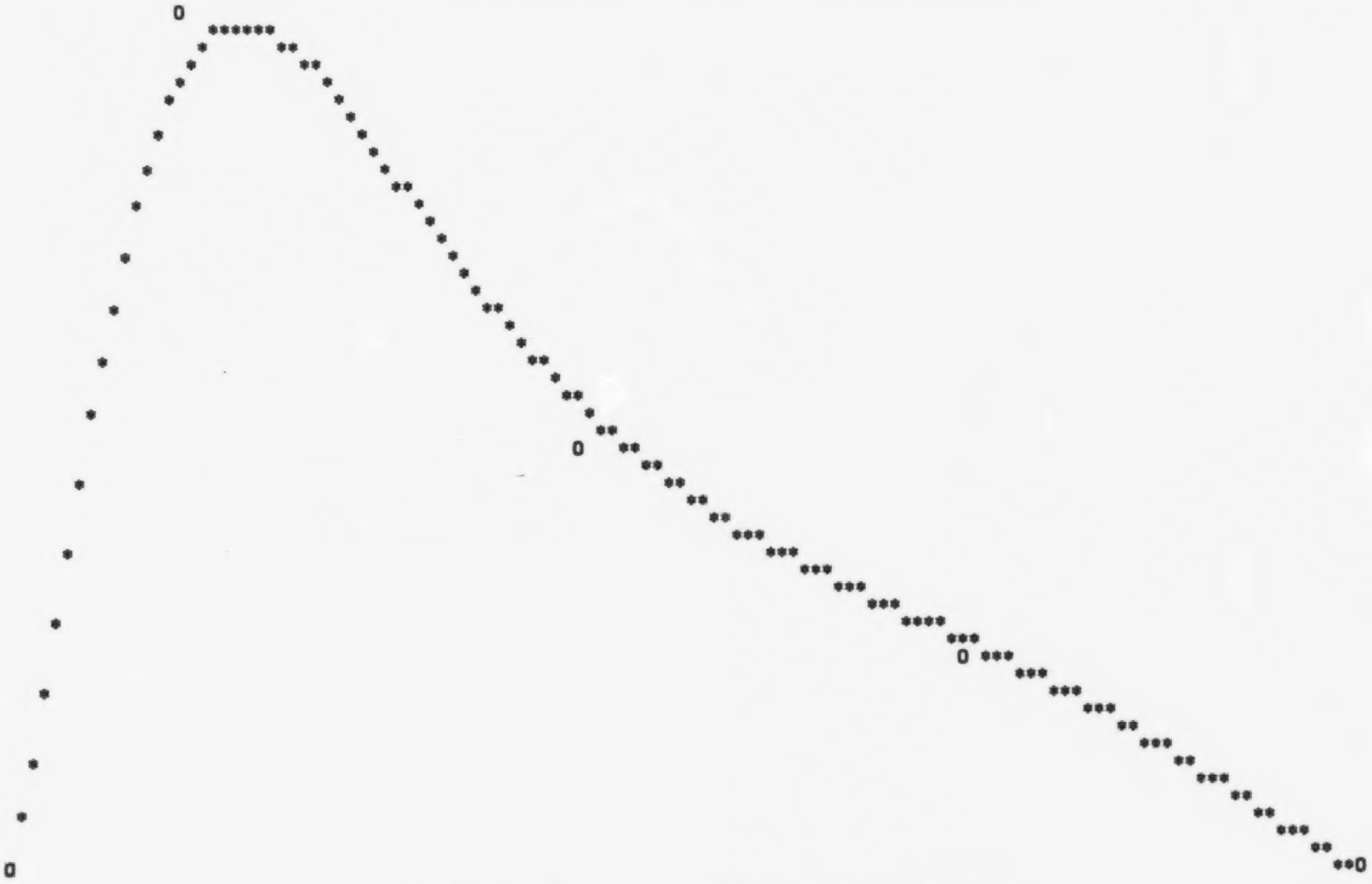
CATEGORY 16 OP COST TRAN 12 TO 33
COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS
EQUATION COEFICIENTS, A= 1.79467773, B= -0.16088867, C= 2.16586304, D= -1.82043457



* = CALCULATED CURVE 0 = ADJUSTED INPUT DATA POINTS

/...

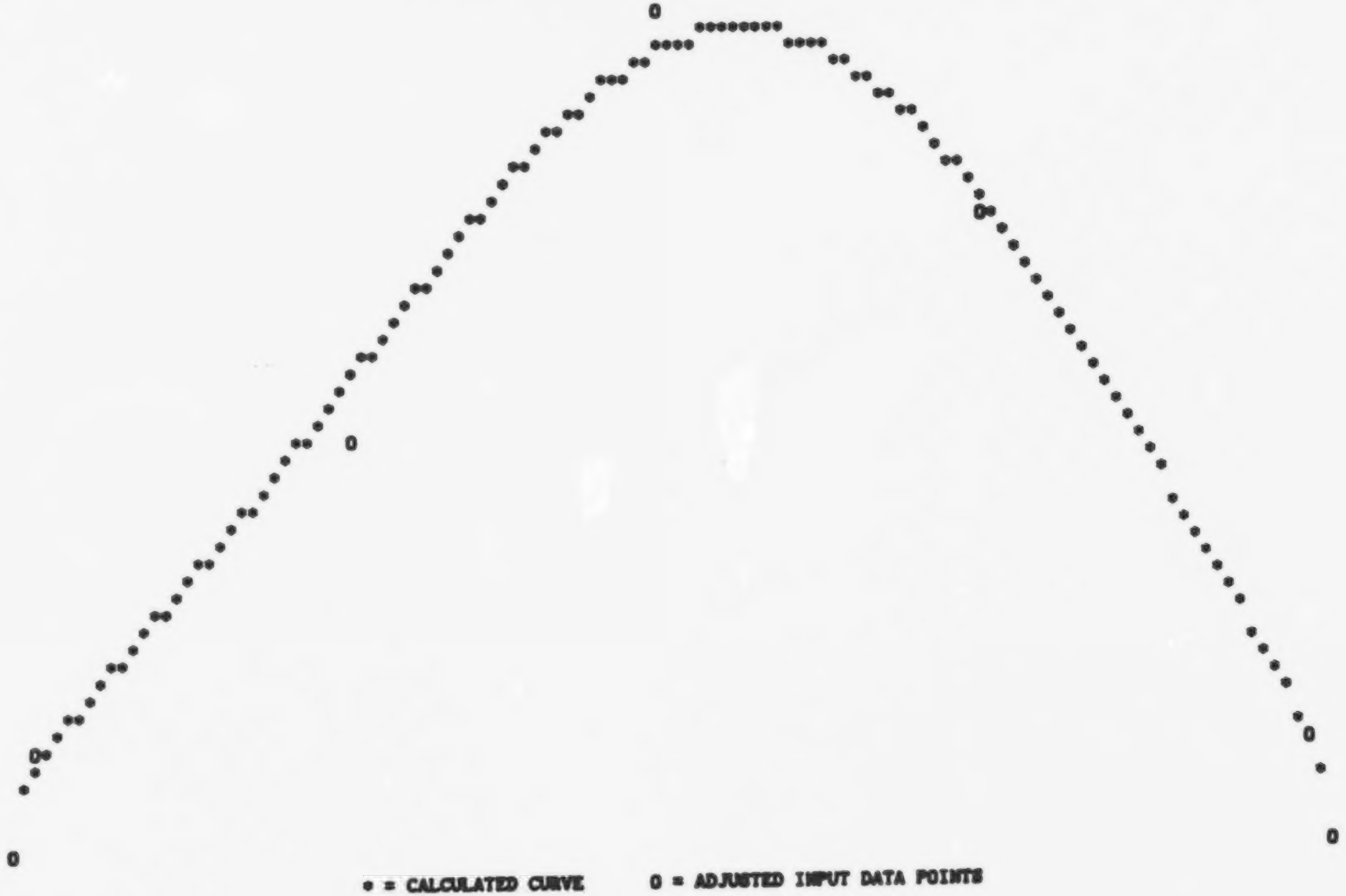
```
                    CATEGORY 18 OP COST PROC         12 TO   33
               COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS
EQUATION COEFICIENTS,  A=     14.7971191 ,  B=     -0.09486103,  C=      2.23726891,  D=     -2.38272095
```



* = CALCULATED CURVE   0 = ADJUSTED INPUT DATA POINTS

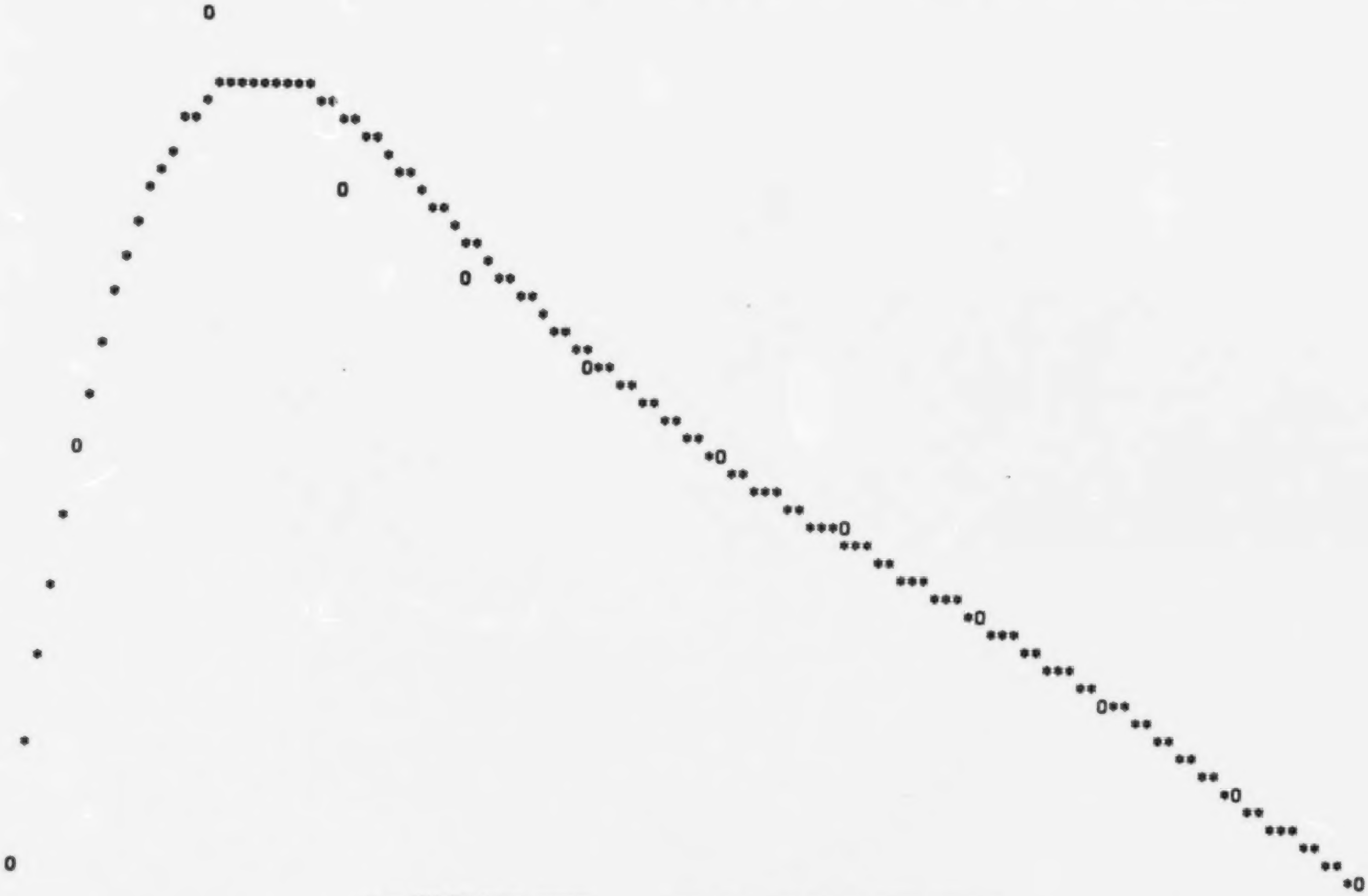
/...

CATEGORY 32 CO PRICE $/T 1 TO 34
COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS
EQUATION COEFICIENTS. A= 0.64076233. B= 0.00002072. C= 1.39499378. D= -1.54304504



/...

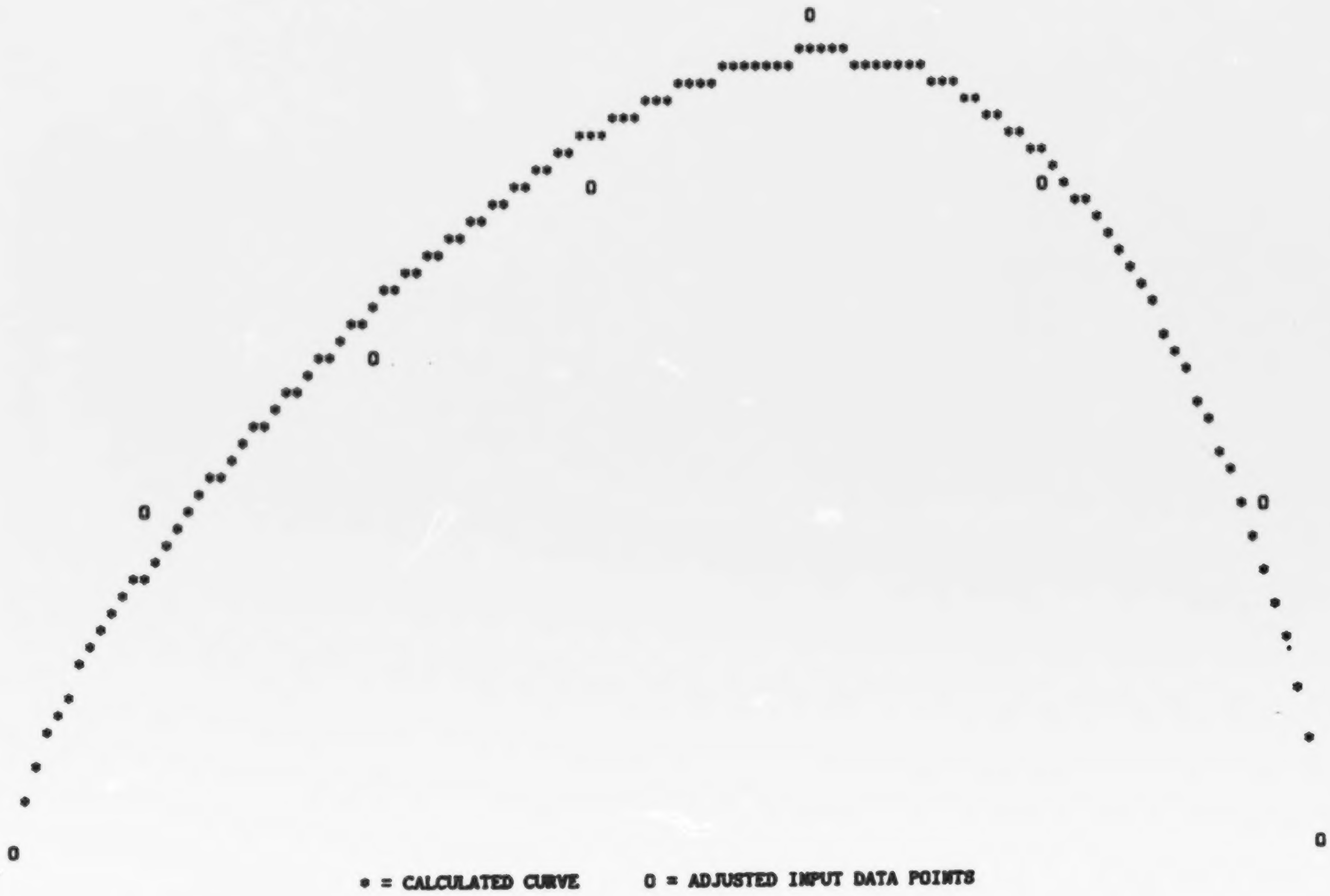
CATEGORY 44 CU PRICE $/T 1 TO 34
COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS
EQUATION COEFICIENTS, A= 6.96801758, B= -0.00184626, C= 1.82972717, D= -2.19046021



* = CALCULATED CURVE 0 = ADJUSTED INPUT DATA POINTS

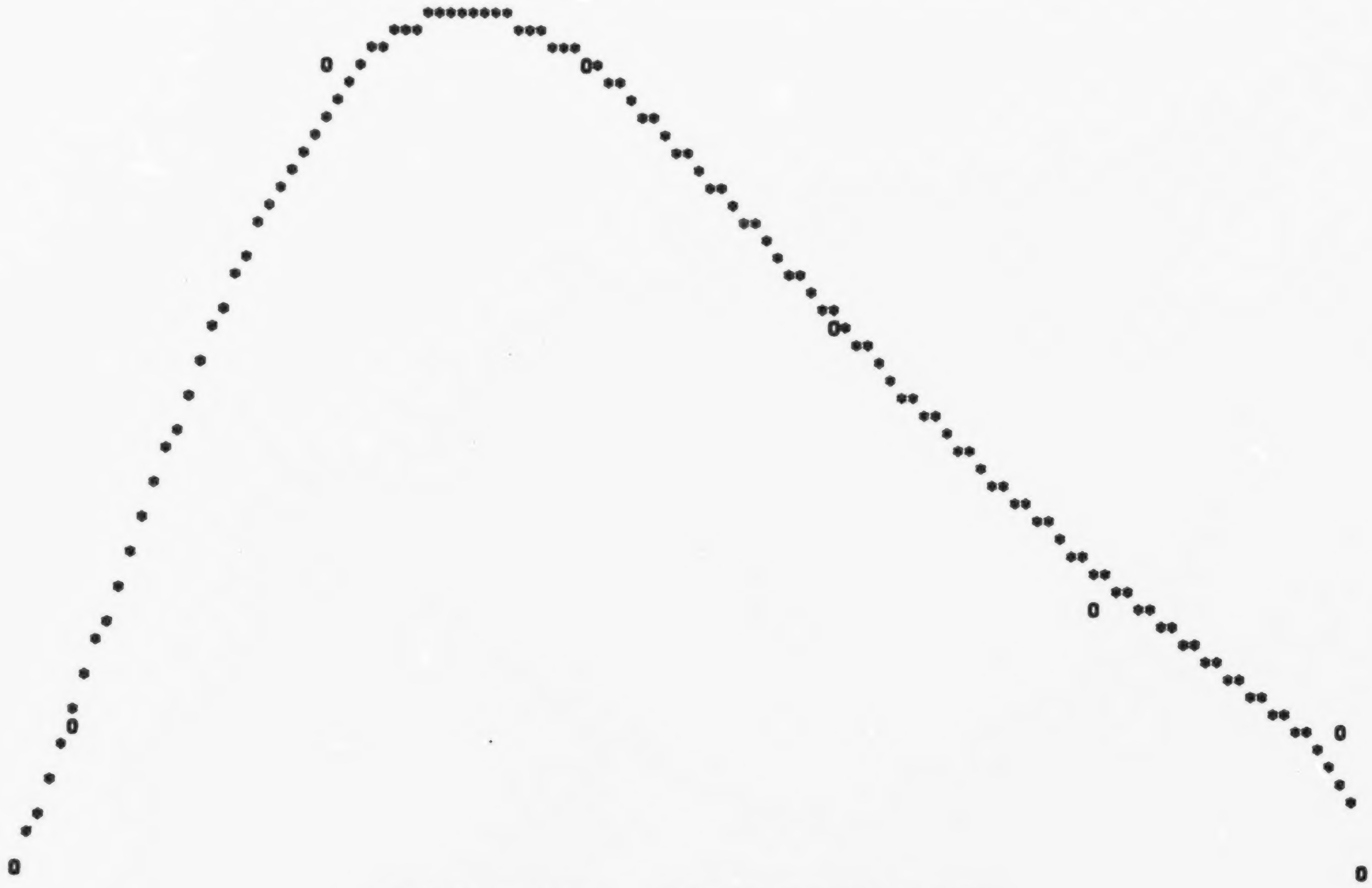
/...

```
                    CATEGORY 56 NI PRICE $/T          1 TO   34
              COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS
EQUATION COEFICIENTS,  A=     1.38903809,  B=    -0.00021617,  C=     1.60368347,  D=    -1.61451721
```



/...

CATEGORY 68 MN PRICE $/T 1 TO 34
COMPARISON OF CALCULATED CURVE WITH ADJUSTED INPUT DATA POINTS
EQUATION COEFICIENTS, A= -2.50025940, B= -0.00151819, C= 2.02924252, D= -1.31836612



* = CALCULATED CURVE 0 = ADJUSTED INPUT DATA POINTS

/...

```
                                        TAX PARAMETER LIST BY INPUT RECORD

COMMODITY RECORD FOR COBALT
     SEVERANCE TAX OPTION = NO SEVERANCE TAX
     FIXED SEVERANCE AMOUNT ($1000) =      0.0
     DEPLETION ALLOWANCE OPTION = NO DEPLETION
     DEPLETION ALLOWANCE =  0.0
     FIXED DEPLETION AMOUNT ($1000) =     0.0
     PAID-FOR PERCENTAGE =     1.000

COMMODITY RECORD FOR COPPER
     SEVERANCE TAX OPTION = NO SEVERANCE TAX
     FIXED SEVERANCE AMOUNT ($1000) =      0.0
     DEPLETION ALLOWANCE OPTION = NO DEPLETION
     DEPLETION ALLOWANCE =  0.0
     FIXED DEPLETION AMOUNT ($1000) =     0.0
     PAID-FOR PERCENTAGE =     1.000

COMMODITY RECORD FOR NICKEL
     SEVERANCE TAX OPTION = NO SEVERANCE TAX
     FIXED SEVERANCE AMOUNT ($1000) =      0.0
     DEPLETION ALLOWANCE OPTION = NO DEPLETION
     DEPLETION ALLOWANCE =  0.0
     FIXED DEPLETION AMOUNT ($1000) =     0.0
     PAID-FOR PERCENTAGE =     1.000

COMMODITY RECORD FOR MANGANESE
     SEVERANCE TAX OPTION = NO SEVERANCE TAX
     FIXED SEVERANCE AMOUNT ($1000) =      0.0
     DEPLETION ALLOWANCE OPTION = NO DEPLETION
     DEPLETION ALLOWANCE =  0.0
     FIXED DEPLETION AMOUNT ($1000) =     0.0
     PAID-FOR PERCENTAGE =     1.000
RATE OF RETURN IS LESS THAN MINUS 90 PCT IN YEAR    14
```

/...

```
                                          1           2           3           4           5           6           7           8           9

GENERAL DATA * * * * * * * * * *

INVESTMENTS
   EXPLORATION - - - - - - - - - -      4636500.    4434375.    3637218.    4884000.    4121905.    4529250.          0.          0.          0.
   LAND ACQUISITION- - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
   RESEACH & DEVELOPMENT,- - -         19106512.   16904880.   23400208.   19398560.   21296144.   48078592.   47328864.          0.          0.
   INVEST. NUMBER 1- MINE- - -               0.          0.          0.          0.          0.          0.   50558048.   56359600.   53761120.
      LIFE - - - - - - - - - - -              0           0           0           0           0           0          10          10          10
      DEPRECIATION - - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 2- TRAN- - -               0.          0.          0.          0.          0.          0.   14304591.   14515873.   12998695.
      LIFE - - - - - - - - - - -              0           0           0           0           0           0          10          10          10
      DEPRECIATION - - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 4- PROC- - -               0.          0.          0.          0.          0.          0.          0.          0.   23936128.
      LIFE - - - - - - - - - - -              0           0           0           0           0           0           0           0          10
      DEPRECIATION - - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 5- PROC- - -               0.          0.          0.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - - -              0           0           0           0           0           0           0           0           0
      DEPRECIATION - - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 6- PROC- - -               0.          0.          0.          0.          0.          0.  124607312.  197358720.  131978096.
      LIFE - - - - - - - - - - -              0           0           0           0           0           0          10          10          10
      DEPRECIATION - - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
   EQUITY CAPITAL- - - - - - - -       19106512.   16904880.   23400208.   19398560.   21296144.   48078592.  236798800.  268234192.  222674032.
   WORKING CAPITAL - - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.

OPERATING COSTS PER UNIT

   MINE- - - - - - - - - - - - -         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
   TRANSPORT - - - - - - - - - -         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
   PROCESS - - - - - - - - - - -         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
UNITS TREATED- - - - - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
MISC. OPERATING EXPENSES - - -               0.          0.          0.          0.          0.          0.          0.          0.          0.

COMMODITY DATA * * * * * * * *

COBALT
   ORE GRADE - - - - - - - - - -        0.002582    0.002532    0.002572    0.002393    0.002629    0.002649    0.002618    0.002567    0.002411
   MILL RECOVERY - - - - - - - -        0.638808    0.646908    0.666939    0.624816    0.636798    0.658619    0.649327    0.642717    0.641631
   MILL CONCENTRATE GRADE- - -            1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
   SMELTER RECOVERY- - - - - - -        1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   SMELTER CONCENTRATE GRADE -             1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000
   REFINER RECOVERY- - - - - - -        1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - - -          0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
      REFINER- - - - - - - - - -          0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - - -           0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO REFINERY- - - - - - - -           0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO MARKET- - - - - - - - -          46.807      43.140      34.470      37.856      34.185      39.594      59.408      38.707      35.572
   PRICE/UNIT RECOVERED- - - -          33072.19    28338.75    31680.00    25542.77    19434.55    35670.94    21482.23    24278.20    18094.57
   UNITS RECOVERED - - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
   REVENUES- - - - - - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
   DEPLETION - - - - - - - - - -              0.          0.          0.          0.          0.          0.          0.          0.          0.
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    SEVERANCE TAX - - - - - - - -         0.        0.        0.        0.        0.        0.        0.        0.        0.
    ROYALTY PAYMENT - - - - - - -         0.        0.        0.        0.        0.        0.        0.        0.        0.

COPPER
    ORE GRADE - - - - - - - - - -   0.010500  0.010535  0.010662  0.010459  0.010652  0.010421  0.010486  0.010621  0.010352
    MILL RECOVERY - - - - - - - -   0.906565  0.920390  0.929843  0.922356  0.922804  0.918072  0.915576  0.920195  0.920270
    MILL CONCENTRATE GRADE- - - -     1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    SMELTER RECOVERY- - - - - - -   0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
    SMELTER CONCENTRATE GRADE -        0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
    REFINER RECOVERY- - - - - - -   0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
    OP. COSTS/UNIT PROCESSED
       SMELTER- - - - - - - - - -     0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
       REFINER- - - - - - - - - -     0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
    TRANS. COSTS/UNIT PROCESSED
       TO SMELTER - - - - - - - -      0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
       TO REFINERY- - - - - - - -      0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
       TO MARKET- - - - - - - - -      0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
    PRICE/UNIT RECOVERED- - - - -    1347.52   1281.71   1859.52   1712.88   1669.24   2240.08   1575.53   1911.03   2148.52
    UNITS RECOVERED - - - - - - -         0.        0.        0.        0.        0.        0.        0.        0.        0.
    REVENUES- - - - - - - - - - -         0.        0.        0.        0.        0.        0.        0.        0.        0.
    DEPLETION - - - - - - - - - -         0.        0.        0.        0.        0.        0.        0.        0.        0.
    SEVERANCE TAX - - - - - - - -         0.        0.        0.        0.        0.        0.        0.        0.        0.
    ROYALTY PAYMENT - - - - - - -         0.        0.        0.        0.        0.        0.        0.        0.        0.

NICKEL
    ORE GRADE - - - - - - - - - -   0.013760  0.013562  0.013722  0.012416  0.012633  0.013512  0.013747  0.013479  0.013450
    MILL RECOVERY - - - - - - - -   0.917484  0.924293  0.924929  0.915118  0.922084  0.917636  0.916813  0.922121  0.906772
    MILL CONCENTRATE GRADE- - - -     1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    SMELTER RECOVERY- - - - - - -   1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000
    SMELTER CONCENTRATE GRADE -        1.000     1.000     1.000     1.000     1.000     1.000     1.000     1.000     1.000
    REFINER RECOVERY- - - - - - -   1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000
    OP. COSTS/UNIT PROCESSED
       SMELTER- - - - - - - - - -     0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
       REFINER- - - - - - - - - -     0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
    TRANS. COSTS/UNIT PROCESSED
       TO SMELTER - - - - - - - -      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
       TO REFINERY- - - - - - - -      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
       TO MARKET- - - - - - - - -     40.176    46.654    49.322    39.058    56.642    38.561    60.977    49.933    43.206
    PRICE/UNIT RECOVERED- - - - -    8031.29   7716.97   7612.88   7578.18   6953.63   6829.13   6053.54   7010.78   8986.48
    UNITS RECOVERED - - - - - - -         0.        0.        0.        0.        0.        0.        0.        0.        0.
    REVENUES- - - - - - - - - - -         0.        0.        0.        0.        0.        0.        0.        0.        0.
    DEPLETION - - - - - - - - - -         0.        0.        0.        0.        0.        0.        0.        0.        0.
    SEVERANCE TAX - - - - - - - -         0.        0.        0.        0.        0.        0.        0.        0.        0.
    ROYALTY PAYMENT - - - - - - -         0.        0.        0.        0.        0.        0.        0.        0.        0.

MANGANESE
    ORE GRADE - - - - - - - - - -   0.272820  0.274034  0.266388  0.269174  0.258943  0.259711  0.251954  0.263992  0.280117
    MILL RECOVERY - - - - - - - -   0.479631  0.505176  0.468326  0.427399  0.422174  0.495561  0.470486  0.534407  0.394924
    MILL CONCENTRATE GRADE- - - -     1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    SMELTER RECOVERY- - - - - - -   1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000
    SMELTER CONCENTRATE GRADE -        1.000     1.000     1.000     1.000     1.000     1.000     1.000     1.000     1.000
    REFINER RECOVERY- - - - - - -   1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000  1.000000
    OP. COSTS/UNIT PROCESSED
       SMELTER- - - - - - - - - -     0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
       REFINER- - - - - - - - - -     0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
    TRANS. COSTS/UNIT PROCESSED
       TO SMELTER - - - - - - - -      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
       TO REFINERY- - - - - - - -      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
       TO MARKET- - - - - - - - -     32.610    33.203    40.175    55.697    61.305    31.380    49.824    41.033    37.787
    PRICE/UNIT RECOVERED- - - - -     536.50    396.32    464.96    669.06    592.58    582.27    522.11    606.33    585.70
    UNITS RECOVERED - - - - - - -         0.        0.        0.        0.        0.        0.        0.        0.        0.
    REVENUES- - - - - - - - - - -         0.        0.        0.        0.        0.        0.        0.        0.        0.
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   DEPLETION - - - - - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   SEVERANCE TAX - - - - - - -            0.         0.         0.         0.         0.         0.         0.         0.         0.
   ROYALTY PAYMENT - - - - - -            0.         0.         0.         0.         0.         0.         0.         0.         0.

FINANCIAL SUMMARY  * * * * * *

CASH FLOW
   EXPENSED EXPLORATION +
   TOTAL REVENUES- - - - - - -            0.         0.         0.         0.         0.         0.         0.         0.         0.
   LESS MINE OPERATING COSTS -            0.         0.         0.         0.         0.         0.         0.         0.         0.
   LESS TRAN OPERATING COSTS -            0.         0.         0.         0.         0.         0.         0.         0.         0.
   LESS PROCESS OPERATING COSTS           0.         0.         0.         0.         0.         0.         0.         0.         0.
   LESS TRANS TO MARKET- - - -            0.         0.         0.         0.         0.         0.         0.         0.         0.
   LESS EXPLORATION COSTS- - -      4636500.   4434375.   3637218.   4884000.   4121905.   4529250.         0.         0.         0.
   LESS DEVELOPMENT COSTS- - -            0.         0.         0.         0.         0.         0.         0.         0.         0.
   LESS LOAN INT. PAYMENTS - -            0.         0.         0.         0.         0.         0.         0.         0.         0.
   LESS DEPRECIATION - - - - -            0.         0.         0.         0.         0.         0.         0.         0.         0.
   LESS TOTAL ROYALTY PAYMENTS-           0.         0.         0.         0.         0.         0.         0.         0.         0.

   EQUALS NET INCOME - - - - -     -4636500.  -4434375.  -3637218.  -4884000.  -4121905.  -4529250.         0.         0.         0.

   PLUS DEPRECIATION - - - - -            0.         0.         0.         0.         0.         0.         0.         0.         0.
   PLUS TOTAL DEPLETION USED -            0.         0.         0.         0.         0.         0.         0.         0.         0.
   PLUS DEFFERED DEDUCTIONS- -            0.         0.         0.         0.         0.         0.         0.         0.         0.
   LESS EQUITY INVESTMENT- - -     19108512.  16904880.  23400208.  19398560.  21296144.  48078592. 236798800. 268234192. 222674032.

   EQUALS CASH FLOW- - - - - -    -23745008. -21339248. -27037424. -24282560. -25418048. -52607840.-236798800.-268234192.-222674032.

ANALYSIS FIGURES
   CONTINUOUS RATE OF RETURN -           0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
   NOTE - * INDICATES THAT A DUAL RATE OF RETURN EXISTED IN THAT YEAR
     0.10 PCT PRESENT VALUE- -    -23730864. -45036080. -72003424. -96196816.-121500320.-173814624.-409056512.-675260928.-896028928.
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                                       10          11          12          13          14          15          16          17          18

GENERAL DATA * * * * * * * * *

INVESTMENTS
   EXPLORATION - - - - - - - - -        0.          0.          0.          0.          0.          0.          0.          0.          0.
   LAND ACQUISITION- - - - - - -        0.          0.          0.          0.          0.          0.          0.          0.          0.
   RESEACH & DEVELOPMENT.- - - -        0.    3200000.          0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 1- MINE- - -   78716864.   64103616.  110321840.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - - -         10          10          10           0           0           0           0           0           0
      DEPRECIATION - - - - - - -        0.          0.          0.   16087988.   21723936.   27100048.   34971728.   41382080.   41382080.
      SALVAGE VALUE- - - - - - -        0.          0.          0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 2- TRAN- - -   13117831.   15003080.   14066123.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - - -         10          10          10           0           0           0           0           0           0
      DEPRECIATION - - - - - - -        0.          0.          0.    2930767.    5788966.    7088835.    8400618.    8400618.    8400618.
      SALVAGE VALUE- - - - - - -        0.          0.          0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 4- PROC- - -   20555712.          0.          0.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - - -         10           0           0           0           0           0           0           0           0
      DEPRECIATION - - - - - - -        0.          0.          0.    2393612.    4449183.    4449183.    4449183.    4449183.    4449183.
      SALVAGE VALUE- - - - - - -        0.          0.          0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 5- PROC- - -   12264905.    9544535.          0.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - - -         10          10           0           0           0           0           0           0           0
      DEPRECIATION - - - - - - -        0.          0.          0.    1226490.    2180943.    2180943.    2180943.    2180943.    2180943.
      SALVAGE VALUE- - - - - - -        0.          0.          0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 6- PROC- - -  178895120.  161065056.  139637312.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - - -         10          10          10           0           0           0           0           0           0
      DEPRECIATION - - - - - - -        0.          0.          0.   12460731.   32196592.   45394400.   63283904.   79390400.   93354128.
      SALVAGE VALUE- - - - - - -        0.          0.          0.          0.          0.          0.          0.          0.          0.
   EQUITY CAPITAL- - - - - - - -  303550208.  252916272.  264025264.  334599936.          0.          0.          0.          0.          0.
   WORKING CAPITAL - - - - - - -        0.          0.          0.  334599936.          0.          0.          0.          0.          0.

-OPERATING COETS PER UNIT

   MINE- - - - - - - - - - - - -     0.0         0.0       28.37518    33.95462    28.68703    42.04370    33.15538    31.76884    30.25519
   TRANSPORT - - - - - - - - - -     0.0         0.0        7.97064     7.77328     8.73723     8.09689     8.69758     8.61312    10.14371
   PROCESS - - - - - - - - - - -     0.0         0.0      121.92805   154.29471   141.70424   125.34489   127.58138   121.91508   136.52721
UNITS TREATED- - - - - - - - - -        0.          0.    1500000.    2500000.    3000000.    3000000.    3000000.    3000000.    3000000.
MISC. OPERATING EXPENSES - - - -        0.          0.          0.          0.          0.          0.          0.          0.          0.

COMMODITY DATA * * * * * * * *

COBALT
   ORE GRADE - - - - - - - - - -   0.002481    0.002642    0.002596    0.002631    0.002589    0.002532    0.002438    0.002557    0.002703
   MILL RECOVERY - - - - - - - -   0.628614    0.661286    0.649524    0.677616    0.629639    0.663924    0.652939    0.645649    0.651193
   MILL CONCENTRATE GRADE- - - -     1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
   SMELTER RECOVERY- - - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.0000[illegible]    1.000000    1.000000
   SMELTER CONCENTRATE GRADE - -      1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000
   REFINER RECOVERY- - - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - - -     0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
      REFINER- - - - - - - - - -     0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO REFINERY- - - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO MARKET- - - - - - - - -     46.122      45.203      56.792      45.799      51.056      51.193      53.777      47.302      44.468
   PRICE/UNIT RECOVERED- - - - -   29313.28    27108.98    26378.09    33350.62    28292.34    20960.16    16719.79    28884.02    32515.31
   UNITS RECOVERED - - - - - - -         0.          0.       2529.       4458.       4891.       5044.       4775.       4953.       5281.
   REVENUES- - - - - - - - - - -         0.          0.   66721248.  148668352.  138383488.  105715072.   79845072.  143057152.  171716272.
   DEPLETION - - - - - - - - - -         0.          0.          0.          0.          0.          0.          0.          0.          0.
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    SEVERANCE TAX - - - - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.
    ROYALTY PAYMENT - - - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.

COPPER
    ORE GRADE - - - - - - - - - -      0.010985    0.010397    0.010095    0.009816    0.010245    0.010459    0.010588    0.010843    0.010792
    MILL RECOVERY - - - - - - - -      0.906854    0.915984    0.922451    0.919803    0.910275    0.916051    0.908825    0.917127    0.913725
    MILL CONCENTRATE GRADE- - -          1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
    SMELTER RECOVERY- - - - - -        0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
    SMELTER CONCENTRATE GRADE -          0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
    REFINER RECOVERY- - - - - -        0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
    OP. COSTS/UNIT PROCESSED
        SMELTER- - - - - - - - - -       0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
        REFINER- - - - - - - - - -       0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
    TRANS. COSTS/UNIT PROCESSED
        TO SMELTER - - - - - - - -        0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
        TO REFINERY- - - - - - - -        0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
        TO MARKET- - - - - - - - -        0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0
    PRICE/UNIT RECOVERED- - - -         1614.16     2211.46     2031.20     1598.43     1923.90     1389.19     1565.52     2291.58     1581.97
    UNITS RECOVERED - - - - - - -            0.          0.      13968.      22572.      27977.      28742.      28868.      29833.      29582.
    REVENUES- - - - - - - - - - -            0.          0.   28371904.   36079040.   53825136.   39928512.   45193616.   68365312.   46797248.
    DEPLETION - - - - - - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.
    SEVERANCE TAX - - - - - - - -            0.          0.          0.          0.          0.          0.          0.          0.         •0.
    ROYALTY PAYMENT - - - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.

NICKEL
    ORE GRADE - - - - - - - - - -      0.013274    0.013785    0.013404    0.013147    0.013256    0.013275    0.012753    0.013540    0.013713
    MILL RECOVERY - - - - - - - -      0.923851    0.922284    0.917235    0.922131    0.906576    0.926744    0.931681    0.929250    0.921588
    MILL CONCENTRATE GRADE- - -          1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
    SMELTER RECOVERY- - - - - -        1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
    SMELTER CONCENTRATE GRADE -           1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000
    REFINER RECOVERY- - - - - -        1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
    OP. COSTS/UNIT PROCESSED
        SMELTER- - - - - - - - - -       0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
        REFINER- - - - - - - - - -       0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
    TRANS. COSTS/UNIT PROCESSED
        TO SMELTER - - - - - - - -        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
        TO REFINERY- - - - - - - -        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
        TO MARKET- - - - - - - - -       54.400      48.816      62.960      54.418      50.103      39.418      38.247      37.039      37.488
    PRICE/UNIT RECOVERED- - - -         6635.23     5878.02     5527.47     7069.97     6839.34     8921.17     7231.21     8206.82     6341.33
    UNITS RECOVERED - - - - - - -            0.          0.      18441.      30308.      36054.      36907.      35644.      37746.      37915.
    REVENUES- - - - - - - - - - -            0.          0.  101933728.  214275200.  246582448.  329257728.  257751216.  309778176.  240428272.
    DEPLETION - - - - - - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.
    SEVERANCE TAX - - - - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.
    ROYALTY PAYMENT - - - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.

MANGANESE
    ORE GRADE - - - - - - - - - -      0.285300    0.276806    0.273395    0.264347    0.253853    0.268456    0.280494    0.263731    0.269005
    MILL RECOVERY - - - - - - - -      0.502424    0.461463    0.523726    0.494462    0.415938    0.469209    0.460241    0.467418    0.469461
    MILL CONCENTRATE GRADE- - -          1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
    SMELTER RECOVERY- - - - - -        1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
    SMELTER CONCENTRATE GRADE -           1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000
    REFINER RECOVERY- - - - - -        1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
    OP. COSTS/UNIT PROCESSED
        SMELTER- - - - - - - - - -       0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
        REFINER- - - - - - - - - -       0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
    TRANS. COSTS/UNIT PROCESSED
        TO SMELTER - - - - - - - -        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
        TO REFINERY- - - - - - - -        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
        TO MARKET- - - - - - - - -       58.305      51.669      43.023      50.912      40.489      51.612      50.051      45.885      56.691
    PRICE/UNIT RECOVERED- - - -          520.39      606.33      585.70      476.99      392.56      452.50      569.37      483.44      555.62
    UNITS RECOVERED - - - - - - -            0.          0.     214776.     326774.     316762.     377885.     387284.     369818.     378861.
    REVENUES- - - - - - - - - - -            0.          0.  125794864.  155868816.  124347488.  170993120.  220510000.  178783856.  210504880.
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   DEPLETION - - - - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   SEVERANCE TAX - - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   ROYALTY PAYMENT - - - - - -          0.         0.         0.         0.         0.         0.         0.         0.         0.

FINANCIAL SUMMARY  * * * * * *

CASH FLOW
   EXPENSED EXPLORATION +
   TOTAL REVENUES- - - - - - -          0.         0. 349064704. 554891264. 563138304. 645894144. 603299840. 699984384. 669446400.
   LESS MINE OPERATING COSTS -          0.         0.  42562768.  84886544.  86061072. 126131088.  99466128.  95306528.  90765552.
   LESS TRAN OPERATING COSTS -          0.         0.  11955957.  19433200.  26211664.  24290672.  26092736.  25839360.  30431120.
   LESS PROCESS OPERATING COSTS         0.         0. 182892080. 385736704. 425112576. 376034560. 382744064. 365745152. 409581568.
   LESS TRANS TO MARKET- - - -          0.         0.  10544947.  18490128.  14881581.  21216448.  21004064.  18601568.  23134144.
   LESS EXPLORATION COSTS- - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   LESS DEVELOPMENT COSTS- - -          0.         0.   4550739.   7584567.   9101482.   9101482.   9101482.   9101482.   9101482.
   LESS LOAN INT. PAYMENTS - -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   LESS DEPRECIATION - - - - -          0.         0.         0.  35099552.  66339584.  86213376. 113286336. 135803184. 149766912.
   LESS TOTAL ROYALTY PAYMENTS-         0.         0.         0.         0.         0.         0.         0.         0.         0.

   EQUALS NET INCOME - - - - -          0.         0.  96558224.   3660800. -64569344.   2906880. -48394496.  49587456. -43334144.

   PLUS DEPRECIATION - - - - -          0.         0.         0.  35099552.  66339584.  86213376. 113286336. 135803184. 149766912.
   PLUS TOTAL DEPLETION USED -          0.         0.         0.         0.         0.         0.         0.         0.         0.
   PLUS DEFFERED DEDUCTIONS- -          0.         0.   4550739.   7584567.   9101482.   9101482.   9101482.   9101482.   9101482.
   LESS EQUITY INVESTMENT- - -  303550208. 252916272. 264025264. 334599936.         0.         0.         0.         0.         0.

   EQUALS CASH FLOW- - - - - - -303550208.-252916272.-162916288.-288254720.  10871722.  98221728.  73993312. 194492112. 115534240.

ANALYSIS FIGURES
   CONTINUOUS RATE OF RETURN -        0.0        0.0        0.0        0.0    -90.000    -40.000    -40.000    -26.644    -20.252
   NOTE - * INDICATES THAT A DUAL RATE OF RETURN EXISTED IN THAT YEAR
     0.10 PCT PRESENT VALUE- - ***************************************************************************************************
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                                            19          20          21          22          23          24          25          26          27

GENERAL DATA * * * * * * * * * *

INVESTMENTS
    EXPLORATION - - - - - - - - -           0.          0.          0.          0.          0.          0.          0.          0.          0.
    LAND ACQUISITION- - - - - - -           0.          0.          0.          0.          0.          0.          0.          0.          0.
    RESEACH & DEVELOPMENT.- - - -           0.          0.          0.          0.          0.          0.          0.          0.          0.
    INVEST. NUMBER 1- MINE- - - -           0.          0.          0.          0.          0.          0.          0.          0.          0.
        LIFE - - - - - - - - - -             0           0           0           0           0           0           0           0           0
        DEPRECIATION - - - - - -    41382080.   41382080.   41382080.   41382080.   25294096.   19658144.   14282047.    6410361.          0.
        SALVAGE VALUE- - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.
    INVEST. NUMBER 2- TRAN- - - -           0.          0.          0.          0.          0.          0.          0.          0.          0.
        LIFE - - - - - - - - - -             0           0           0           0           0           0           0           0           0
        DEPRECIATION - - - - - -     8400618.    8400618.    8400618.    8400618.    5469851.    2611652.    1311783.          0.          0.
        SALVAGE VALUE- - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.
    INVEST. NUMBER 4- PROC- - - -           0.          0.          0.          0.          0.          0.          0.          0.          0.
        LIFE - - - - - - - - - -             0           0           0           0           0           0           0           0           0
        DEPRECIATION - - - - - -     4449183.    4449183.    4449183.    4449183.    2055571.          0.          0.          0.          0.
        SALVAGE VALUE- - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.
    INVEST. NUMBER 5- PROC- - - -           0.          0.          0.          0.          0.          0.          0.          0.          0.
        LIFE - - - - - - - - - -             0           0           0           0           0           0           0           0           0
        DEPRECIATION - - - - - -     2180943.    2180943.    2180943.    2180943.     954454.          0.          0.          0.          0.
        SALVAGE VALUE- - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.
    INVEST. NUMBER 6- PROC- - - -           0.          0.          0.          0.          0.          0.          0.          0.          0.
        LIFE - - - - - - - - - -             0           0           0           0           0           0           0           0           0
        DEPRECIATION - - - - - -    93354128.   93354128.   93354128.   93354128.   80893408.   61157536.   47959728.   30070224.   13963731.
        SALVAGE VALUE- - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.
    EQUITY CAPITAL- - - - - - - -           0.          0.          0.          0.          0.          0.          0.          0.          0.
    WORKING CAPITAL - - - - - - -           0.          0.          0.          0.          0.          0.          0.          0.          0.

OPERATING COSTS PER UNIT

    MINE- - - - - - - - - - - - -     29.91309    35.02025    37.15149    35.60149    35.16556    29.76476    27.41251    33.80933    28.63858
    TRANSPORT - - - - - - - - - -      8.82858     8.27443     8.71826     9.50596     9.84035     8.50798     8.03441    10.62633     9.68522
    PROCESS - - - - - - - - - - -    130.04559   126.70126   138.55661   132.17854   123.87463   127.88161   126.15251   122.08336   154.95735
UNITS TREATED- - - - - - - - - -     3000000.    3000000.    3000000.    3000000.    3000000.    3000000.    3000000.    3000000.    3000000.
MISC. OPERATING EXPENSES - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.

COMMODITY DATA * * * * * * * * *

COBALT
    ORE GRADE - - - - - - - - - -     0.002490    0.002629    0.002478    0.002364    0.002600    0.002327    0.002395    0.002568    0.002634
    MILL RECOVERY - - - - - - - -     0.633241    0.630405    0.673835    0.659813    0.664660    0.647420    0.676494    0.654249    0.669397
    MILL CONCENTRATE GRADE- - - -       1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
    SMELTER RECOVERY- - - - - - -     1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
    SMELTER CONCENTRATE GRADE - -        1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000       1.000
    REFINER RECOVERY- - - - - - -     1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
    OP. COSTS/UNIT PROCESSED
        SMELTER- - - - - - - - -        0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
        REFINER- - - - - - - - -        0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
    TRANS. COSTS/UNIT PROCESSED
        TO SMELTER - - - - - - -         0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
        TO REFINERY- - - - - - -         0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
        TO MARKET- - - - - - - -        49.042      57.667      33.476      57.098      43.902      55.882      51.875      48.389      52.175
    PRICE/UNIT RECOVERED- - - - -     21981.09    28849.22    19916.02    35021.25    28129.92    26946.58    20816.14    35299.69    21383.61
    UNITS RECOVERED - - - - - - -        4730.       4972.       5009.       4680.       5184.       4519.       4860.       5040.       5289.
    REVENUES- - - - - - - - - - -   103972112.  143442480.   99757984.  163888768.  145825072.  121762880.  101155776.  177918688.  113095504.
    DEPLETION - - - - - - - - - -           0.          0.          0.          0.          0.          0.          0.          0.          0.
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   SEVERANCE TAX - - - - - - - -           0.           0.           0.           0.           0.           0.           0.           0.           0.
   ROYALTY PAYMENT - - - - - - -           0.           0.           0.           0.           0.           0.           0.           0.           0.

 COPPER
   ORE GRADE - - - - - - - - - -     0.010590     0.010251     0.010175     0.010752     0.010158     0.010001     0.010612     0.010297     0.010476
   MILL RECOVERY - - - - - - - -     0.913139     0.906702     0.929934     0.916606     0.920561     0.919554     0.910517     0.931338     0.920698
   MILL CONCENTRATE GRADE- - - -       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
   SMELTER RECOVERY- - - - - - -     0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
   SMELTER CONCENTRATE GRADE - -       0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
   REFINER RECOVERY- - - - - - -     0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - - -      0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
      REFINER- - - - - - - - - -      0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - - -        0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
      TO REFINERY- - - - - - - -        0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
      TO MARKET- - - - - - - - -        0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
   PRICE/UNIT RECOVERED- - - - -      1912.46      1388.30      1565.52      1330.62      2468.96      1593.42      2197.16      1571.24      2182.85
   UNITS RECOVERED - - - - - - -       29010.       27885.       28385.       29565.       28053.       27589.       28966.       28771.       28937.
   REVENUES- - - - - - - - - - -    55481008.    38712608.    44437296.    39339888.    69262656.    43960848.    63686704.    45206576.    63164720.
   DEPLETION - - - - - - - - - -           0.           0.           0.           0.           0.           0.           0.           0.           0.
   SEVERANCE TAX - - - - - - - -           0.           0.           0.           0.           0.           0.           0.           0.           0.
   ROYALTY PAYMENT - - - - - - -           0.           0.           0.           0.           0.           0.           0.           0.           0.

 NICKEL
   ORE GRADE - - - - - - - - - -     0.013681     0.013691     0.013344     0.013398     0.013029     0.013544     0.013552     0.013651     0.012928
   MILL RECOVERY - - - - - - - -     0.922090     0.912754     0.924337     0.923998     0.916963     0.915017     0.923009     0.926100     0.920140
   MILL CONCENTRATE GRADE- - - -       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
   SMELTER RECOVERY- - - - - - -     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000
   SMELTER CONCENTRATE GRADE - -        1.000        1.000        1.000        1.000        1.000        1.000        1.000        1.000        1.000
   REFINER RECOVERY- - - - - - -     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - - -       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000
      REFINER- - - - - - - - - -       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - - -        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
      TO REFINERY- - - - - - - -        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
      TO MARKET- - - - - - - - -       49.415       32.703       52.246       51.372       39.983       59.111       47.667       58.190       57.017
   PRICE/UNIT RECOVERED- - - - -      7970.06      7457.76      8802.79      7216.92      6257.64      8100.68      7696.56      7551.65      8843.61
   UNITS RECOVERED - - - - - - -       37844.       37489.       37003.       37140.       35841.       37179.       37526.       37927.       35686.
   REVENUES- - - - - - - - - - -   301619968.   279580672.   325731840.   268039264.   224278080.   301178624.   288818432.   286413568.   315596544.
   DEPLETION - - - - - - - - - -           0.           0.           0.           0.           0.           0.           0.           0.           0.
   SEVERANCE TAX - - - - - - - -           0.           0.           0.           0.           0.           0.           0.           0.           0.
   ROYALTY PAYMENT - - - - - - -           0.           0.           0.           0.           0.           0.           0.           0.           0.

 MANGANESE
   ORE GRADE - - - - - - - - - -     0.274980     0.276721     0.265601     0.279845     0.266751     0.267565     0.277695     0.266727     0.265027
   MILL RECOVERY - - - - - - - -     0.534256     0.487939     0.520629     0.523521     0.516828     0.510526     0.510417     0.431006     0.495901
   MILL CONCENTRATE GRADE- - - -       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
   SMELTER RECOVERY- - - - - - -     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000
   SMELTER CONCENTRATE GRADE - -        1.000        1.000        1.000        1.000        1.000        1.000        1.000        1.000        1.000
   REFINER RECOVERY- - - - - - -     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000     1.000000
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - - -       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000
      REFINER- - - - - - - - - -       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - - -        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
      TO REFINERY- - - - - - - -        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
      TO MARKET- - - - - - - - -       47.767       50.034       35.726       45.689       44.274       49.988       48.936       43.309       35.015
   PRICE/UNIT RECOVERED- - - - -       624.37       424.57       367.26       545.74       629.53       425.11       366.29       727.50       419.52
   UNITS RECOVERED - - - - - - -      440728.      405069.      414838.      439514.      413593.      409797.      425220.      344883.      394281.
   REVENUES- - - - - - - - - - -   275179520.   171980240.   152353824.   239861456.   260369712.   174207904.   155755616.   250902144.   165409520.
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    DEPLETION - - - - - - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.
    SEVERANCE TAX - - - - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.
    ROYALTY PAYMENT - - - - - - -            0.          0.          0.          0.          0.          0.          0.          0.          0.

FINANCIAL SUMMARY  * * * * * *

CASH FLOW
    EXPENSED EXPLORATION +
    TOTAL REVENUES- - - - - - - -  736252416.  633715712.  622280704.  711129088.  699735296.  641110016.  609416192.  760440832.  657265920.
    LESS MINE OPERATING COSTS -     89739248.  105060736.  111454464.  106804448.  105496672.   89294256.   82237504.  101427968.   85915728.
    LESS TRAN OPERATING COSTS -     26485712.   24823280.   26154784.   28517888.   29521040.   25523936.   24103232.   31878976.   29055664.
    LESS PROCESS OPERATING COSTS   390136576.  380103680.  415669760.  396536552.  371623680.  383644672.  378457344.  366249984.  464871936.
    LESS TRANS TO MARKET- - - -     23154336.   21779856.   16921456.   22255920.   19972144.   22935248.   22849344.   17387568.   16116482.
    LESS EXPLORATION COSTS- - -            0.          0.          0.          0.          0.          0.          0.          0.          0.
    LESS DEVELOPMENT COSTS- - -      9101482.    9101482.    9101482.    9101482.    9101482.    9101482.    9101482.    9101482.    9101482.
    LESS LOAN INT. PAYMENTS - -            0.          0.          0.          0.          0.          0.          0.          0.          0.
    LESS DEPRECIATION - - - - - -  149766912.  149766912.  149766912.  149766912.  114667360.   83427328.   63553552.   36480576.   13963731.
    LESS TOTAL ROYALTY PAYMENTS-           0.          0.          0.          0.          0.          0.          0.          0.          0.

    EQUALS NET INCOME - - - - - -   47868416.  -56920064.-106767840.   -1852928.   49353216.   27183360.   29114112.  197914624.   38241280.

    PLUS DEPRECIATION - - - - - -  149766912.  149766912.  149766912.  149766912.  114667360.   83427328.   63553552.   36480576.   13963731.
    PLUS TOTAL DEPLETION USED -            0.          0.          0.          0.          0.          0.          0.          0.          0.
    PLUS DEFFERED DEDUCTIONS- -      9101482.    9101482.    9101482.    9101482.    9101482.    9101482.    9101482.    9101482.    9101482.
    LESS EQUITY INVESTMENT- - -            0.          0.          0.          0.          0.          0.          0.          0.          0.

    EQUALS CASH FLOW- - - - - - -  206736800.  101948320.   52080544.  157015456.  173122048.  119712160.  101769136.  243496672.   61306480.

 ANALYSIS FIGURES
    CONTINUOUS RATE OF RETURN -      -13.211     -10.827      -9.741      -7.059      -4.913      -3.743      -2.891      -1.278      -0.943
    NOTE - * INDICATES THAT A DUAL RATE OF RETURN EXISTED IN THAT YEAR
      0.10 PCT PRESENT VALUE- - ************************************-899654080.-730599936.-613679360.-514382592.-277039104.-217341600.
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                                      28          29          30          31          32          33          34

GENERAL DATA * * * * * * * * *

INVESTMENTS
   EXPLORATION - - - - - - - -        0.          0.          0.          0.          0.          0.          0.
   LAND ACQUISITION- - - - - -        0.          0.          0.          0.          0.          0.          0.
   RESEACH & DEVELOPMENT - - -        0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 1- MINE- - -        0.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - -         0           0           0           0           0           0           0
      DEPRECIATION - - - - - -        0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -        0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 2- TRAN- - -        0.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - -         0           0           0           0           0           0           0
      DEPRECIATION - - - - - -        0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -        0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 4- PROC- - -        0.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - -         0           0           0           0           0           0           0
      DEPRECIATION - - - - - -        0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -        0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 5- PROC- - -        0.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - -         0           0           0           0           0           0           0
      DEPRECIATION - - - - - -        0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -        0.          0.          0.          0.          0.          0.          0.
   INVEST. NUMBER 6- PROC- - -        0.          0.          0.          0.          0.          0.          0.
      LIFE - - - - - - - - - -         0           0           0           0           0           0           0
      DEPRECIATION - - - - - -        0.          0.          0.          0.          0.          0.          0.
      SALVAGE VALUE- - - - - -        0.          0.          0.          0.          0.          0.          0.
   EQUITY CAPITAL- - - - - - -        0.          0.          0.          0.          0.          0.          0.
   WORKING CAPITAL - - - - - -        0.          0.          0.          0.          0.          0.          0.

OPERATING COSTS PER UNIT

   MINE- - - - - - - - - - - -   27.20061    46.11247    35.93475    32.93745    29.11067    28.89999     3.33000
   TRANSPORT - - - - - - - - -    8.67856     8.63639     8.18825     9.39910     8.31656     8.80445     0.80000
   PROCESS - - - - - - - - - -  141.62140   133.37959   130.52190   147.50250   128.26472   123.07216    11.80000
UNITS TREATED- - - - - - - - -   3000000.    3000000.    3000000.    3000000.    3000000.    3000000.    1500000.
MISC. OPERATING EXPENSES - - -         0.          0.          0.          0.          0.          0.          0.

COMMODITY DATA * * * * * * * *

COBALT
   ORE GRADE - - - - - - - - -   0.002499    0.002642    0.002575    0.002599    0.002537    0.002499    0.002676
   MILL RECOVERY - - - - - - -   0.640401    0.669669    0.638139    0.652465    0.658097    0.678695    0.634016
   MILL CONCENTRATE GRADE- - -     1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
   SMELTER RECOVERY- - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   SMELTER CONCENTRATE GRADE -      1.000       1.000       1.000       1.000       1.000       1.000       1.000
   REFINER RECOVERY- - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - -     0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
      REFINER- - - - - - - - -     0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO REFINERY- - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO MARKET- - - - - - - -     55.225      53.975      55.545      60.935      36.467      46.770      49.484
   PRICE/UNIT RECOVERED- - - -   34371.56    24962.70    29614.92    27387.42    26343.28    23355.88    30102.19
   UNITS RECOVERED - - - - - -      4802.       5308.       4929.       5087.       5009.       5089.       2545.
   REVENUES- - - - - - - - - - 165038400.  132513296.  145970432.  139311040.  131956672.  118863712.   76603424.
   DEPLETION - - - - - - - - -         0.          0.          0.          0.          0.          0.          0.
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   SEVERANCE TAX - - - - - - -         0.          0.          0.          0.          0.          0.          0.
   ROYALTY PAYMENT - - - - - -         0.          0.          0.          0.          0.          0.          0.

COPPER
   ORE GRADE - - - - - - - - -   0.010184    0.010224    0.010086    0.010678    0.010753    0.010427    0.009775
   MILL RECOVERY - - - - - - -   0.934721    0.911830    0.908702    0.928321    0.920724    0.919412    0.920860
   MILL CONCENTRATE GRADE- - -     1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
   SMELTER RECOVERY- - - - - -   0.0         0.0         0.0         0.0         0.0         0.0         0.0
   SMELTER CONCENTRATE GRADE -     0.0         0.0         0.0         0.0         0.0         0.0         0.0
   REFINER RECOVERY- - - - - -   0.0         0.0         0.0         0.0         0.0         0.0         0.0
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - -     0.0         0.0         0.0         0.0         0.0         0.0         0.0
      REFINER- - - - - - - - -     0.0         0.0         0.0         0.0         0.0         0.0         0.0
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - -      0.0         0.0         0.0         0.0         0.0         0.0         0.0
      TO REFINERY- - - - - - -      0.0         0.0         0.0         0.0         0.0         0.0         0.0
      TO MARKET- - - - - - - -      0.0         0.0         0.0         0.0         0.0         0.0         0.0
   PRICE/UNIT RECOVERED- - - -    2032.63     1465.37     1548.36     2297.30     1444.81     1555.51     1929.82
   UNITS RECOVERED - - - - - -     28251.      27964.      28316.      29732.      29703.      28761.      13503.
   REVENUES- - - - - - - - - -  57424352.   40981168.   43841024.   68304336.   42914576.   44737856.   26056336.
   DEPLETION - - - - - - - - -         0.          0.          0.          0.          0.          0.          0.
   SEVERANCE TAX - - - - - - -         0.          0.          0.          0.          0.          0.          0.
   ROYALTY PAYMENT - - - - - -         0.          0.          0.          0.          0.          0.          0.

NICKEL
   ORE GRADE - - - - - - - - -   0.013703    0.012763    0.013108    0.013162    0.012890    0.013008    0.013944
   MILL RECOVERY - - - - - - -   0.926321    0.923701    0.908243    0.924514    0.904636    0.928304    0.918310
   MILL CONCENTRATE GRADE- - -     1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
   SMELTER RECOVERY- - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   SMELTER CONCENTRATE GRADE -      1.000       1.000       1.000       1.000       1.000       1.000       1.000
   REFINER RECOVERY- - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - -     0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
      REFINER- - - - - - - - -     0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO REFINERY- - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO MARKET- - - - - - - -     54.920      52.731      45.583      44.502      40.392      56.162      46.514
   PRICE/UNIT RECOVERED- - - -    6606.66     9019.14     8521.13     7843.52     8549.71     6700.55     9035.47
   UNITS RECOVERED - - - - - -     38080.      35367.      35715.      36504.      34982.      36227.      19207.
   REVENUES- - - - - - - - - - 251580528.  318982144.  304332544.  286322176.  299082240.  242738528.  173544064.
   DEPLETION - - - - - - - - -         0.          0.          0.          0.          0.          0.          0.
   SEVERANCE TAX - - - - - - -         0.          0.          0.          0.          0.          0.          0.
   ROYALTY PAYMENT - - - - - -         0.          0.          0.          0.          0.          0.          0.

MANGANESE
   ORE GRADE - - - - - - - - -   0.276396    0.269883    0.264378    0.280189    0.273951    0.271208    0.264381
   MILL RECOVERY - - - - - - -   0.476607    0.514304    0.410227    0.540550    0.468928    0.487718    0.550905
   MILL CONCENTRATE GRADE- - -     1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
   SMELTER RECOVERY- - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   SMELTER CONCENTRATE GRADE -      1.000       1.000       1.000       1.000       1.000       1.000       1.000
   REFINER RECOVERY- - - - - -   1.000000    1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
   OP. COSTS/UNIT PROCESSED
      SMELTER- - - - - - - - -     0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
      REFINER- - - - - - - - -     0.0000      0.0000      0.0000      0.0000      0.0000      0.0000      0.0000
   TRANS. COSTS/UNIT PROCESSED
      TO SMELTER - - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO REFINERY- - - - - - -      0.000       0.000       0.000       0.000       0.000       0.000       0.000
      TO MARKET- - - - - - - -     50.420      48.149      50.501      45.538      49.066      48.272      41.738
   PRICE/UNIT RECOVERED- - - -     459.59      566.80      619.22      518.46      414.58      359.37      730.94
   UNITS RECOVERED - - - - - -    395197.     416406.     325366.     454369.     385390.     396816.     218473.
   REVENUES- - - - - - - - - - 181628512.  236017584.  201472840.  235570768.  159774976.  142601824.  159690416.
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    DEPLETION - - - - - - - - - -        0.         0.         0.         0.         0.         0.         0.
    SEVERANCE TAX - - - - - - - -        0.         0.         0.         0.         0.         0.         0.
    ROYALTY PAYMENT - - - - - - -        0.         0.         0.         0.         0.         0.         0.

FINANCIAL SUMMARY  * * * * * *

CASH FLOW
    EXPENSED EXPLORATION *
    TOTAL REVENUES- - - - - - - -655671552. 728493824. 695616512. 729508096. 633728256. 548941824. 435894016.
    LESS MINE OPERATING COSTS -   81601808. 138337408. 107894256.  98812352.  87332608.  86699968.   4994999.
    LESS TRAN OPERATING COSTS -   26635680.  25909168.  24564736.  28197296.  24949968.  26413328.   1200000.
    LESS PROCESS OPERATING COSTS 424864000. 400138752. 391565568. 442507264. 384794112. 369216256.  17700000.
    LESS TRANS TO MARKET- - - -   22282352.  22200896.  18333072.  22625504.  20505328.  21427664.  10137865.
    LESS EXPLORATION COSTS- - -          0.         0.         0.         0.         0.         0.         0.
    LESS DEVELOPMENT COSTS- - -    9101482.   9101482.   9101482.   9101482.   9101482.   9101482.   4550739.
    LESS LOAN INT. PAYMENTS - -          0.         0.         0.         0.         0.         0.         0.
    LESS DEPRECIATION - - - - -          0.         0.         0.         0.         0.         0.         0.
    LESS TOTAL ROYALTY PAYMENTS-         0.         0.         0.         0.         0.         0.         0.

    EQUALS NET INCOME - - - - - - 91186432. 132806400. 144157696. 128264448. 107045120.  36083456. 397310208.

    PLUS DEPRECIATION - - - - - -.       0.         0.         0.         0.         0.         0.         0.
    PLUS TOTAL DEPLETION USED -          0.         0.         0.         0.         0.         0.         0.
    PLUS DEFFERED DEDUCTIONS- -    9101482.   9101482.   9101482.   9101482.   9101482.   9101482.   4550739.
    LESS EQUITY INVESTMENT- - -          0.         0.         0.         0.         0.         0.         0.

    EQUALS CASH FLOW- - - - - - -100287904. 141907872. 153259168. 137365920. 116146592.  45184928. 401660864.

ANALYSIS FIGURES
    CONTINUOUS RATE OF RETURN -      -0.442      0.176      0.744      1.183      1.511      1.629      2.497
    NOTE - * INDICATES THAT A DUAL RATE OF RETURN EXISTED IN THAT YEAR
      0.10 PCT PRESENT VALUE- - -119783392.  18124016. 186913824. 300140544. 412674560. 458410368. 844994560.
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                                  SUMMARY DATA


                                       ENTERPRISE EVALUATION SIMLTN. 3M.TONNES NODULES(DRY)P.A. [CUPRION PROCESS]


                          LAST YEAR ADDITIONS TO CASH FLOW
CUMULATIVE WORKING CAPITAL     334599936.
CUMULATIVE SALVAGE VALUE               0.

                          OTHER CUMULATIVE VALUES
REVENUES                     14558650400.
ROYALTIES                              0.
TOTAL DEPRECIATION            1497668610.
FEDERAL INCOME TAXES                   0.
CASH FLOW                      896540416.

                          LAST YEARS ANALYSIS FIGURES
CONTINUOUS RATE OF RETURN          2.497
  0.10 PCT PRESENT VALUE       844994560.


                 COMMODITY SUMMARY DATA

COMMODITY             REVENUES     UNITS RECOVERED         PRICE/UNIT


COBALT              2935180800.             108982.         26378.086
COPPER              1106071040.             624964.          2031.201
NICKEL              6167830530.             802732.          5527.469
MANGANESE           4349576170.            8652092.           585.703

  TOTAL INITIAL INVESTMENT DATA

   ITEM                        AMOUNT

EXPLORATION                  26243232.
LAND ACQUISITION                    0.
RESEARCH & DEVELOPMENT      198715760.
MINE AND TRANS SHIPS        497826816.
PROCESS PLANT AND PORT      999842048.
WORKING CAPITAL             334599936.
MISC INVEST & OP COSTS              0.

TOTAL UNITS TREATED          65500000.
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                        EXPECTED DISTRIBUTION FOR PCT RATE OF RETURN
        **CURVE REPRESENTS THE PROBABILITY THE LISTED VALUE HAS OF OCCURRING BASED ON  150 SIMULATIONS**

PCT RATE OF        PERCENT
  RETURN         OCCURRENCE

    -1               2.7  ***
     0               5.3  *****
     1              26.0  **************************
     2              38.7  ***************************************
     3              25.3  *************************
     4               2.0  **

MEAN PCT RATE OF RETURN  =           1.88
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                         ROR RESULTS FOR EACH SIMULATION

2.497      2.565      2.661      3.542      2.016      2.302      1.587     -0.809
2.156      0.406      2.104      1.300      2.983      2.353      2.416      3.265
1.425      2.577      1.735      2.718      1.334      2.962      2.551      3.209
1.056      3.265      0.696      1.675      1.749      2.063      2.752      1.932
2.417      1.313      2.954      2.334      1.104      2.680      1.920      1.635
0.950      1.212      2.086      1.772      2.401      2.520      3.118      2.146
1.491      0.660      2.968      1.615      3.196      1.988      0.540      3.109
0.818      2.398      2.229      2.966      2.792      1.267      1.678      1.971
0.394      0.574      2.158      1.309      0.476      3.164      2.802      1.110
2.531      2.103      1.827      3.106      2.715      0.534      2.019      3.425
0.011      0.951      2.957      1.709      1.823      2.488      1.528      0.066
1.068     -0.580      2.053      2.663      2.053      1.993      2.400      2.406
1.420      1.155     -0.556      3.891      2.950      2.804      2.533      1.192
2.389      1.229      2.219      1.402      1.337      2.024      1.071      2.668
3.157      2.222      1.370      2.535      2.351      3.002      1.607      0.561
0.912      2.858     -0.655      1.932      2.251      0.811      0.223      1.989
2.917      2.267      0.987      2.101     -0.004      1.329      1.500      0.582
3.641      1.795      2.362      1.887      1.732      1.903      1.175      0.117
2.432      1.191      1.432      2.365      2.656      1.411
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LOS/PCN/SCN.2/WP.11
27 February 1987

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEA-BED AUTHORITY
AND FOR THE INTERNATIONAL TRIBUNAL
FOR THE LAW OF THE SEA
Special Commission 2
Fifth session
Kingston, Jamaica
30 March-16 April 1987

MAIN ELEMENTS OF A TRAINING PROGRAMME

Working paper by the Secretariat

1. Considering that it will be possible to adopt concrete measures on training as a consequence of the registration of the pioneer investors, Special Commission 2 decided to proceed at its fifth session to the consideration of the establishment of policies and procedures for a training programme and to consider the question of co-operating institutions. The Secretariat was asked to review the existing documentation of the Special Commission relevant to training and extract all pertinent elements, elaborating on them where possible (LOS/PCN/L.40, para. 7).

2. The subject of training has had priority status in the programme of work of Special Commission 2 for some time and a substantial number of meetings have been devoted to it, the discussions being reflected in the reports of the Chairman (see in particular LOS/PCN/L.20, para. 23; LOS/PCN/L.25, paras. 6 and 7; and LOS/PCN/L.30, paras. 4-9). The Secretariat has prepared document LOS/PCN/SCN.2/WP.9 on training, and several of its earlier working papers, documents LOS/PCN/SCN.2/WP.6, LOS/PCN/SCN.2/WP.7 and LOS/PCN/SCN.2/WP.8, which are interrelated, also concern manpower requirements and training. Delegations have supplied information and advice (see LOS/PCN/SCN.2/WP.9 and Add.1) and existing institutions have also expressed an interest in the subject (see LOS/PCN/SCN.2/L.4 and LOS/PCN/L.40).

3. Two important aspects of the training question were delineated early on in the discussions of Special Commission 2: the importance of the role of the registered pioneer investors in all aspects of training; and the need to conceive of a

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"training programme", formulated and implemented in a coherent manner. The proces for designating trainees, established in resolution II, paragraph 12 (a) (ii), would reflect manpower needs in respect of the nature and relative availability of the special skills required and an assessment of the numbers involved. The designation process, however, could not incorporate solutions to such questions as when and where the best opportunities for important training will arise, particularly the more specialized and/or on-the-job forms of training, and the methods, facilities, duration and cost-effectiveness of the different types of training that should be offered by the registered pioneer investors - matters equally important for meeting the objective set forth in the chapeau of paragraph 12. There has thus been a preference for a programmatic approach, with strong emphasis on the importance of consultations and co-operation with the registered pioneer investors, particularly on identifying training priorities, providing for them and deciding on the best timing. There has also been some emphasis on the promotion of co-operative arrangements between the Preparatory Commission and the registered pioneer investors. Some delegations have seen merit in encouraging joint arrangements among the registered pioneer investors, for the purposes of paragraph 12, including the provision of training.

4. The Secretariat has reviewed the elements of existing documentation which appear to remain valid and pertinent to the immediate task of designing a training programme, and finds that it may be most useful to concentrate on the following aspects:

(a) General policy and priorities for a training programme;

(b) Designation procedures;

(c) Guidelines for programme implementation;

(d) Possible establishment of a steering committee to supervise programme implementation on behalf of the Preparatory Commission;

(e) Promotion of relevant education and training by existing institutions or under special arrangements;

(f) Possible training in the context of exploration under resolution II, paragraph 12 (a) (i).

The present paper is organized accordingly.

General policy and priorities

5. Resolution II, paragraph 12, is specific with regard to two points: training of personnel designated by the Preparatory Commission is for the purpose set forth in the chapeau, and the provision of such training is an obligation of the registered pioneer investors as part of the overall pioneer investors régime established by resolution II. Thus, the scope of training will correspond to the scope of the "pioneer activities" permitted under this régime and the training provided must serve the established purpose. Designated personnel would therefore

be familiarized with the techniques and knowledge acquired by the registered pioneer investors so that the Enterprise may have the benefit of that expertise. The relationship between registered pioneer investors and designated trainees in the pre-Enterprise period is essentially the same as the later relationship between contractor and Enterprise personnel undergoing training during the exploration and exploitation phases of their contracts.

6. At the same time, implementation of paragraph 12 is understood to be an integral part of the Special Commission's mandate, requiring harmonization of the actions to be taken and the assurances to be given by registered pioneer investors (and/or Certifying States) with its findings on the requirements for viable Enterprise operations. In documents LOS/PCN/SCN.2/WP.6 to LOS/PCN/SCN.2/WP.9, the Secretariat had concentrated on a sequential approach to training corresponding closely to the steps that were likely to be followed for project planning and development by the Enterprise. Factors determining the timing and pace of project development would have automatic effects, it was assumed, on the scheduling of training to be provided by registered pioneer investors. The key opportunities for important training may be considered as arising either in the year before the entry into force of the Convention or in the period before the commencement of mining activities under the Convention, whichever proves most appropriate. Furthermore, the key training would be that aimed directly at ensuring that the requirements of the initial Enterprise - primarily managerial and technical - were met.

7. In discussing this approach, the Special Commission concluded that a certain amount of training must none the less be undertaken at an early stage. A much longer lead-time, it was believed, would be needed for the development of scientific and technical personnel. Managers, on the other hand, would be more readily available, and from a broad geographic range. Some delegations have also seen more general benefits to be gained from earlier training from the point of view of expanding expertise among States members of the Authority, thus facilitating its decision-making capabilities and contributing to co-operative relations among sea-bed mining operators and the Enterprise. It may therefore be desirable to allow also for less specialized and more interdisciplinary training, not necessarily depending on registered pioneer investors to perform this service, but rather on the promotion of relevant training through existing institutions and arrangements.

8. It remains true, however, that guarantees with regard to specialized and/or concentrated training in the key period prior to the effective establishment of the Enterprise would be a priority component of the programme.

9. Another important policy consideration for the Special Commission has been the need to ensure that the measures it recommends should carry no financial implications for the Preparatory Commission nor should they commit the Enterprise to any particular course of action.

Designation procedures

10. Establishing categories and levels of skills requires looking at the functional aspects of manpower requirements. Attempts to inventory skills are dependent on the information and advice that can be given by pioneer investors as

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well as by delegations from countries with experience in planning and operating large-scale mining operations. Sea-bed mining requirements can only be inferred from such information in the absence of any directly applicable model. As regards priorities, attention is drawn to the Australian submission in document LOS/PCN/SCN.2/WP.9, annex II, where some categories bear an asterisk to indicate that the skills involved are not normally found in that discipline or would have to be above average for that particular area.

11. Establishing requisite qualifications and experience for each category and level is again a matter of examining management experience in large-scale projects. Information available in the public domain relative to pioneer experience was reviewed by the Secretariat in document LOS/PCN/SCN.2/WP.9, annex I.

12. It is understood that the ability to specify an appropriate number per category and level in proportion to predicted requirements will improve as progress is made in the study of operational options and technology acquisition strategies. The only relatively concrete relationship that can be drawn at the present stage is with the initial, start-up requirements of the Enterprise. Considering also such factors as attrition, it may be best to proceed on the basis of an annually revised roster of designated candidates.

13. As regards language requirements, these may be supplemented by placement procedures which seek to minimize the effects of language training on the costs and duration of total training.

Guidelines for programme implementation

14. Assuming the establishment of a roster, which would be revised annually, certain guidelines and procedures are necessary for the placement of trainees and the maintenance of personnel records. The primary guidelines would be those ensuring that the best facilities and training methods are used, incorporating the appropriate technical know-how, and that there is equal sharing of the burden among all registered pioneer investors.

15. Equal sharing might best be achieved by examining costs and taking account of the level of technical development involved and the quality of the training offered, since these factors might not always be directly reflected in training costs.

16. With respect to the technological aspects of training, it would be difficult to introduce any specific guidelines, in view of the fact that the most relevant training in this area would occur under the provisions of the Convention, either in connection with transfer of technology under an agreement or within the context of a joint venture (annex III, art. 5). Relevant training available under the pioneer régime is that which would develop expertise in the formulation of technology acquisition strategies.

17. Particularly in the early stages of a training programme, it will be necessary to ensure that the knowledge and experience gained from training will have general utility, since the Preparatory Commission cannot assume responsibility of assuring trainees of employment.

18. Where trainees are directly involved by the registered pioneer investor in its "pioneer activities", the question of training facilities would not arise. However, the Preparatory Commission should be apprised of cases where the registered pioneer investor finds it necessary to resort to existing education, training or research facilities for certain training, so that the quality and appropriateness of the training can be verified.

19. The device of rotating trainees among registered pioneer investors has also been mentioned, although it would only appear to be beneficial to certain categories of personnel, closer to the managerial level, who need broader experience.

20. For the purposes of effective and timely placement, it would be advisable to require registered pioneer investors (or Certifying States in implementation of para. 12 (b) (ii)) to inform the Preparatory Commission of planned "pioneer activities" which would present appropriate training opportunities.

21. Finally, in the interests of promoting co-operative arrangements, registered pioneer investors might be invited to consider special methods, such as jointly sponsored technical seminars, for presenting the knowledge and experience gained in the course of their activities. Such devices might help to avoid a certain amount of unnecessary duplication and expense.

Possible establishment of a Steering Committee

22. The Special Commission clearly depends on the close co-operation of pioneer investors and other delegations with appropriate experience for the formulation of the training programme. The same requirement holds true for programme implementation. The Preparatory Commission's responsibilities in giving the necessary approvals and supervising implementation would be most effectively performed by a small committee, which would include the registered pioneer investors and receive the support services of the Secretariat. Such a committee should also have the ability to propose modifications to the programme.

Promotion of training by existing institutions

23. The idea of having "co-operating institutions" has already been introduced by the Special Commission (see LOS/PCN/L.40, para. 7). It will be necessary to distinguish between institutions co-operating directly with the registered pioneer investors (as noted in para. 18 above) and other institutions. The Special Commission has already received information on the International Ocean Institute and has noted its active interest. There will be other organizations which the Preparatory Commission may decide to consider as co-operating institutions. For training in marine scientific disciplines, the Special Commission may wish to address formal inquiries to the Intergovernmental Oceanographic Commission.

24. For this component of the programme, however, it may be necessary to reiterate that the Preparatory Commission cannot assume the financial responsibilities.

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Training in the context of exploration under resolution II

25. Attention to this question may at some point be advisable. While it has been alluded to several times in the past, no conclusions have been drawn. Nevertheless, several points may be usefully made at this juncture in the interest of clarifying the objectives of programmed training.

26. First, there may be some differences in the scope of training available in connection with "pioneer activities" and training that could be done as part of the process of exploring a reserved area.

27. Secondly, the solution to any question regarding the scope of exploration, and therefore the scope of training in that context, would lie with the cost implications of exploration under paragraph 12 (a) (i). Clearly, the Preparatory Commission is under no obligation to request exploration of a scope corresponding to activities undertaken following an exploration contract with the Authority. The Commission would presumably determine the scope of exploratory work and of training in the process of submitting a request to the registered pioneer investors, bearing in mind the implications for the initial fund for the Enterprise when it is established.

28. Finally, the importance of the opportunities for training, orientation and the further development of skills is undeniable in an "exploration" context, however this may be defined. If work on a reserved area is undertaken or initiated prior to the entry into force of the Convention, the training programme would need to be modified to take that work into account. It would then be a matter for consultation with the registered pioneer investors and might require readjustment of the programme.

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LOS/PCN/SCN.2/WP.12
9 March 1987

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PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2
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Kingston, Jamaica
30 March-16 April 1987

A NUCLEUS ENTERPRISE

Note by the Secretariat

1. At its last session, Special Commission 2 decided to consider, as a distinct item, the establishment of an initial, "nucleus" Enterprise, for which the Secretariat was asked to re-examine its earlier working papers and extract elements that would be useful to this discussion (LOS/PCN/L.40, para. 7). This decision is part of a modification to the Special Commission's current programme of work which calls for sets of recommendations to be drawn up to reflect circumstances that may prevail at the time of entry into force of the Convention (see LOS/PCN/L.40, para. 3). It was thus decided to consider formulating a recommendation on a "nucleus" Enterprise to provide for continued pre-feasibility work in the event that delays in the projected start-up of sea-bed mining persist at the time of the establishment of the Enterprise.

2. The Special Commission, as early as the second session, called for a pragmatic approach to planning for the Enterprise, noting that, initially, the Enterprise might best be regarded as a nucleus establishment capable, however, of maturing quickly under favourable operating conditions (see LOS/PCN/L.5).

3. The probable activities and expert requirements of the initial Enterprise have been examined in working paper 7 according to the same basic sequence set forth in LOS/PCN/SCN.2/WP.6 for the planning and development of a project. The time periods attached to that sequence assumed that sea-bed mining would be viable and that the Convention would be in force at the beginning of the next decade. On those assumptions the Secretariat had considered possible ways of ensuring that the time available could be used most productively. Thus the device of an ad hoc expert core

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group was proposed in LOS/PCN/SCN.2/WP.7 in order to assist the Preparatory Commission in preparing the way for the Enterprise and to ensure that the initial Enterprise in its most important aspects - managerial and technical - could be in place with a minimum of delay. At the third session the Special Commission had set this approach aside in view of the many uncertainties involved.

4. Although assuming different circumstances from those postulated for the formulation of the present recommendation on a nucleus Enterprise, LOS/PCN/SCN.2/WP.7 remains relevant. It can be useful if one discounts the specific dates and time periods used and focuses on the initial phase in the sequence described in paragraphs 1, 2, 4 and 5, and as illustrated in the first segment of figure 1. For example, many of the functions ascribed to the core group in LOS/PCN/SCN.2/WP.7 could be undertaken by the nucleus Enterprise. These would conceivably include: monitoring development in the deep sea-bed mining industry, exploring alternative technology acquisition and operating strategies, preparing techno-economic feasibility studies, identifying broad staff requirements and suggesting some possible project implementation strategies. In addition, personnel of a nucleus Enterprise might draft operating manuals and administrative procedures, survey the financial markets to establish the position regarding the financing of operations, make rough forecasts of future markets and prices of metals in connection with techno-economic feasibility studies and roughly evaluate the reserved areas.

5. For the purpose of formulating a recommendation on a nucleus Enterprise, some general features should be noted.

6. First, once the functions described in LOS/PCN/SCN.2/WP.7 for the period prior to entry into force of the Convention are set in the context of the Authority, they are susceptible to modification. States would have the power through their membership in the Authority to adopt policy decisions and institute concrete measures relative to the Enterprise.

7. Secondly, the concept of a nucleus Enterprise able only to pursue feasibility work immediately raises questions as to its organizational status, governance and budgeting.

8. One aspect to consider would be the feasibility of using the staff of the Authority to carry out such work and to assume the responsibility of reporting on developments relevant to the Enterprise. However, it may be that the functions of that staff would be similarly curtailed in the period before start-up of sea-bed mining and they might not necessarily be able to perform the monitoring and pre-feasibility work required. Therefore, consideration might be given to proceeding in terms of an "expert group" clearly earmarked for the Enterprise.

9. Another consideration would be the degree to which a nucleus Enterprise needs to be independent of the Authority. It would appear that support services could easily be shared. In previous working papers, the Secretariat has assumed that for the first planning stages, staff would be provided by the Authority on a cost-sharing basis.

10. Management of a nucleus Enterprise might be considered in various ways. One approach might be to limit management personnel to the Governing Board and the

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Director-General, supported by a small staff of experts, sharing administrative and other support services with the Authority. A second approach might be simply to utilize the management personnel of the Authority with support by the expert group clearly delineated in organizational terms as a "nucleus" Enterprise but temporarily subsumed under the Authority's budget.

11. The technical expertise of the Enterprise would in both of the above cases reside in the group of experts. It is estimated that no more than four to six such experts would be required to follow up any pre-feasibility work undertaken by the Preparatory Commission and to prepare regular reports.

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QUESTIONS RELATING TO TRAINING OF PERSONNEL FOR THE ENTERPRISE IN ACCORDANCE WITH THE UNITED NATIONS CONVENTION ON THE LAW OF THE SEA

Working paper prepared by a working group of the Contact Group of the Group of 77 on the Enterprise (Bangladesh, Brazil, Cameroon, Jamaica, Kenya, Pakistan, Thailand and Tunisia)

INTRODUCTION

1. The Enterprise is the organ of the Authority responsible for carrying out activities in the Area. The relevant provisions on the Enterprise pertaining, in particular, to personnel requirements training and transfer of technology are enshrined in the United Nations Convention on the Law of the Sea. The sequencing of activities of the Enterprise in its preparatory stage is of crucial importance, particularly in the field of training, so as to facilitate a smooth transition to its operational phase.

2. Paragraph 12 of resolution II underlines the obligations of pioneer investors to provide training free of all costs at all levels for personnel designated by the Preparatory Commission and to undertake, before the entry into force of the Convention, to perform the obligations prescribed in the Convention relating to the transfer of technology and scientific knowledge.

3. A training programme to meet the obligations outlined in resolution II is seen as an essential prerequisite that will ensure that the Enterprise is able to carry out activities in the Area in such a manner as to keep pace with States and other entities. The Preparatory Commission is, therefore, required to prepare a list of

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personnel to be designated for training by the pioneer investors. One of the practical aspects of training is that of direct experience on the job, which must be provided, not necessarily on the site reserved for the Enterprise, by the pioneer investors. The Group of 77, therefore, expects that each pioneer investor would train an adequate number of nominees of the Preparatory Commission in actual exploratory work so that the Enterprise keeps pace with the pioneer investors.

4. While providing for the immediate training requirements of the Enterprise, due consideration should be given to the long-term training requirements as they relate to the obligations of the pioneer investors. However, the present paper focuses only on the immediate training requirements of the Enterprise.

I. IDENTIFICATION OF DISCIPLINES

5. The immediate training requirements of the Enterprise are in those areas of disciplines which would enable it to work through its pre-operational phase and those required for the early phases of its operation. In this context, the disciplines outlined in annex I, paragraph 2, of document LOS/PCN/SCN.2/WP.9 could be a basis for a priority list of individuals to receive such training under the provisions of paragraph 12 (a) (ii) of resolution II of the Convention. Although such a listing of disciplines cannot at this stage be regarded as exhaustive, the following broad areas could be considered essential:

(a) Engineering:

(i) Chemical

(ii) Electrical/electronic systems

(iii) Mechanical

(iv) Metallurgical

(v) Mining

(b) Marine science:

(i) Cartography

(ii) Geology

(iii) Geophysics

(iv) Hydrography

(v) Oceanography

6. The disciplines outlined above have, as their corollary, lower-level skills of technicians. Of necessity, a number of technicians will have to be selected for

training by the pioneer investors. Because these individuals will require hands-on training, the need to develop an adequate pool of skills in these areas is to be borne in mind.

7. Other disciplines for which training is to be provided by the pioneer investors may be given a lower priority, since existing skills in these areas largely available in many developing countries could easily be adapted to the requirements of deep-sea-bed mining.

II. NUMBER OF PERSONNEL TO MEET THE IMMEDIATE REQUIREMENTS OF THE ENTERPRISE

8. The training of potential personnel for the Enterprise by pioneer investors is mandated by resolution II. Regardless of the number that may be required for training, a deep-sea-bed mining venture by the Enterprise must, in the first place, be efficient and cost-effective. However, the viability of deep-sea-bed mining cannot be considered as a pre-condition for the fulfilment of those obligations under the Convention. The training is inextricably linked to the registration of pioneer investors and is intended for the purpose of enabling the Enterprise to carry out activities in the Area in such a manner as to keep pace with the exploratory activities of the pioneer investors. As a matter of fact, exploration was already being carried out by them before the Convention was adopted. Admittedly, if the pioneer investors had not done anything in the Area, then they would not have qualified as pioneer investors and the foregoing provisions in the Convention would not have been drafted. Consequently, before the establishment of the Enterprise a group of potential personnel should already have been trained in accordance with the relevant provisions of the Convention.

9. So far, the activities of the pioneer investors include exploration resulting in identification, quantification, test recovery methods, analysis and market feasibility studies. Those disciplines which would enable the pioneer investors to undertake exploration of the Area should necessarily be the disciplines in which training is required immediately following their registration, in order to provide a pool of trained personnel from which the staff of the Enterprise can be selected. This would enable the Enterprise, at the time of its establishment, to be in a position to undertake the necessary start-up measures.

10. The Preparatory Commission is responsible for the designation of personnel for training at all levels. Such designation must not infringe upon the prerogative of the Director-General in the area of appointments for the Enterprise. 1/ Consequently, latitude in the number of individuals to be selected for training is necessary. The Preparatory Commission would, therefore, seek to have training based on disciplines relating to exploration of the Area as well as on a variety of potential organizational structures. The need for flexibility in the number of persons to be designated for training is supported by the fact that the mining methods of the pioneer investors may vary and the decisions on the technical approach and the configuration of the Enterprise cannot be established *a priori* by the Preparatory Commission.

11. In this connection, the Preparatory Commission has benefited from the information provided by the representative of the Soviet Union in his statement to Special Commission II (Enterprise) on 1 April 1986, at the fourth session of the Preparatory Commission, held at Kingston, Jamaica, as well as the information supplied by Australia (LOS/PCN/SCN.2/WP.9, annex II). Similarly, the Preparatory Commission may benefit from the valuable information provided by other pioneer investors.

12. On the basis of the foregoing, bearing in mind existing variations in operating modalities among pioneer investors and the fact that Training would not obligate the Enterprise to provide employment to a trainee, the number to be trained should be at least three individuals, at each level of job classification.

III. SELECTION CRITERIA

13. The Preparatory Commission should give priority to training those individuals required for disciplines identified in paragraphs 3 and 5 above. The selection of trainees should give due expression to the common heritage principle as embodied in the Convention. Selection should, therefore, be based on the principle of equitable geographic distribution and the need to make a deep-sea-bed mining venture by the Enterprise as efficient and cost-effective as possible. The criteria to be used in selecting individuals should include the following:

(a) (i) Individuals to be selected for training in the advanced technical fields should possess a graduate degree at the university level in the discipline for which advanced training would be provided by the pioneer investors;

(ii) Preferably, these individuals should possess two to four years' on-the-job training and be no more than 35 years of age;

(b) Technicians should be certified as possessing those minimum skills which would enable them to be licensed in the appropriate field in their respective countries and, preferably, should not be more than 30 years of age;

(c) Trainees are required to possess a working knowledge of the language in which training is offered. To ensure this, the Preparatory Commission/Enterprise, with the assistance of the pioneer investors, will provide programmes of language orientation for trainees.

14. The selection criteria for management personnel which would have a lower priority should also be based on the above-mentioned principles and criteria. Trainees in the field of management woud be recruited in the first instance from among individuals possessing academic qualifications and on-the-job experience in their respective fields. At a later stage, individuals possessing appropriate academic qualifications only may be recruited for training. However, the declaration in the chapeau to paragraph 12 of resolution II should be borne in mind, and every effort should be made soon after the registration of pioneer investors to provide the Enterprise with the needed personnel so as to enable it to

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carry out activities in the Area in such a manner as to keep pace with the pioneer investor.

IV. DURATION OF TRAINING

15. The length of the training programme would be determined by the level of skills to be achieved. It would be related to what is required along with the qualifications outlined in section III above on selection criteria, to achieve a comparable level of skills that would enable the Enterprise to keep pace with the pioneer investors.

V. LONG-TERM REQUIREMENTS

16. Immediately following the establishment of the Enterprise, the need may arise for the personnel selected for employment to undergo, on a rotation basis, training in different technologies and methodologies employed by pioneer investors. As is the practice, they should also undergo interdisciplinary orientation. The rotation of trainees would have the benefit of familiarizing the personnel of the Enterprise with alternative options for the launching of a deep-sea-bed mining venture. This training along with that provided during the pre-operational phase are to be seen in the context of training outlined in paragraph 12 (a) (ii) and (iii) of resolution II. The long-term obligations regarding training of the pioneer investors are specified in article 144 and annex III, article 5, paragraph 3 (a), of the United Nations Convention on the Law of the Sea.

Notes

1/ Annex IV, article 7 of the United Nations Convention on the Law of the Sea.

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Special Commission 2
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THE INTERNATIONAL VENTURE

(*Study submitted by the Republic of Colombia*)

CONTENTS

Page

BACKGROUND AND OUTLINE 374

PREAMBLE 375

INTRODUCTION 376

DOCUMENTS AND PROPOSALS ALREADY SUBMITTED 377

I. QUESTIONS RAISED BY THE ANALYSIS OF PARAGRAPHS 14 OF THE UNDERSTANDING AND 12 OF RESOLUTION II 378

II. IMPACT ON THE ENTERPRISE OF TRENDS IN OCEAN MINING 380

BACKGROUND AND OUTLINE

1. This study has been prepared in accordance with the proposal made by the Colombian delegation when it accepted the assignment unanimously approved by Special Commission 2 of the Preparatory Commission at its August-September 1986 session. The study was carried out under the leadership of the Ministry of Foreign Affairs of Colombia in co-operation with the International Ocean Institute (IOI), and is divided into two parts.

2. The first part contains the theoretical justification for the joint venture. Its viability is examined within the context of future ocean mining projects, and these projects are analysed against the broad background of the development of high technology and its impact on both developed and developing countries. Reference is made to important changes in the management and financing of high-technology research and development, and suggestions are made for incorporating new trends into the structure of the Enterprise. This first part covers the preparatory period, which includes exploration, research and development and training.

3. In implementation of resolution II, paragraph 12, and paragraph 14 of the Understanding of September 1986, four options are proposed, and their costs and benefits calculated:

(a) Option 1. The pioneer investors will proceed individually. Their assistance to the Preparatory Commission in the exploration of the first mine site, in the training of personnel and in the preparation of a work plan for the future Enterprise may take various forms, ranging from providing the services on a cost-free and interest-free basis to providing them at 50 per cent of cost or at different percentages or interest rates;

(b) Option 2. The pioneer investors will form a model research and development enterprise; this will reduce the cost to themselves, and simultaneously serve the future major multinational enterprise of the Sea-Bed Authority;

(c) Option 3. The pioneer investors will establish a joint venture for research and development with international official assistance for the benefit of the Preparatory Commission and the Multinational Enterprise. This third option offers benefits at relatively low cost, and gives the Preparatory Commission and the third world countries the opportunity of participating "passively" in the research and development;

(d) Option 4. The pioneer investors will establish in association with the Preparatory Commission, before the Convention enters into force, a "Sui Generis Model Entity" whose functions will be personnel training, transfer of technology, environmental impact studies, exploration of the first mine site and design of the Mining Enterprise. As soon as the Convention enters into force, the group of pioneer investors will associate themselves with the nucleus Enterprise, which will carry forward without a break in continuity the activities initiated by the Model Entity and will be responsible for carrying out the various mining processes, from exploration to marketing (see figures 1, 2, 3 and 4):

(i) This fourth option seems to be the one which offers the greatest benefits at the lowest cost. Moreover, it is the only one which would enable the Preparatory Commission and the third world countries to participate in the research and development from the outset, thus complying fully with the preambular declaration;

(ii) The two phases referred to in the fourth option must be considered as a single whole; nevertheless, provision needs to be made for a mechanism which can decouple the first portion of the activities from the subsequent part, which would take place when the Convention enters into force.

4. In drawing up the following proposal, we wish to base this work on the Preamble to the United Nations Convention on the Law of the Sea, part of which is reproduced below:

"PREAMBLE

...

"Conscious that the problems of ocean space are closely interrelated and need to be considered as a whole,

"Recognizing the desirability of establishing through this Convention, with due regard for the sovereignty of all States, a legal order for the seas and oceans which will facilitate international communication, and will promote the peaceful uses of the seas and oceans, the equitable and efficient utilization of their resources, the conservation of their living resources, and the study, protection and preservation of the marine environment,

"Bearing in mind that the achievement of these goals will contribute to the realization of a just and equitable international economic order which takes into account the interests and needs of mankind as a whole and, in particular, the special interests and needs of developing countries, whether coastal or land-locked,

"Desiring by this Convention to develop the principles embodied in resolution 2749 (XXV) of 17 December 1970 in which the General Assembly of the United Nations solemnly declared *inter alia* that the area of the sea-bed and ocean floor and the subsoil thereof, beyond the limits of national jurisdiction, as well as its resources, are the common heritage of mankind, the exploration and exploitation of which shall be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States,

"Believing that the codification and progressive development of the law of the sea achieved in this Convention will contribute to the strengthening of peace, security, co-operation and friendly relations among all nations in conformity with the principles of justice and equal rights and will promote the economic and social advancement of all peoples of the world, in accordance with the Purposes and Principles of the United Nations as set forth in the Charter."

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5. In view of the above declaration, and with a view to contributing to the search for a more prosperous standard of living, Colombia submits this document prepared under the authority of the Ministry of Foreign Affairs, and co-ordinated by Ambassador Antonio José Uribe Portocarrero, as a contribution to the implementation of resolution II and the organization of the Enterprise, which form part of the rules approved in the United Nations Convention on the Law of the Sea, 1982.

6. Colombia further hopes that the scientific research and technological innovations generated through the international co-operative effort for the development of ocean mining will enable the developing countries to alleviate the absolute poverty which the World Bank has defined as the condition characterized by poor health, malnutrition, chronic privations and reduced life expectancy. It adds that the human suffering and waste of talent implicit in this way of life constitute one of the greatest tragedies of the modern age.

7. This objective, of meeting despair head on, is one of the priorities of the Government of Colombia. This same concern was echoed in resolution GA/Res.800(XVI)/0/86, of the sixteenth regular session of the Organization of American States, meeting from 11 to 15 November 1986 in Guatemala City, Guatemala, in which the American States resolved:

> "To support with enthusiasm the proposal made by the President of Colombia, Virgilio Barco, in his recent statement before the United Nations General Assembly that war be waged against extreme poverty in the hemisphere, with the support of the competent international organizations."

INTRODUCTION

8. During the fourth session of the Preparatory Commission for the International Sea-Bed Authority and for the International Tribunal for the Law of the Sea, the delegation of Colombia was given the mandate to carry out the study of a joint venture covering the whole range of activities of an integrated mining project, from prospecting and exploration, financing, research and development (including assessment of the environmental impact study) and training up to mining operations, transport, processing and marketing.

9. The proposal was warmly welcomed, and was approved unanimously in Special Commission 2. A number of delegations considered that now was the best time to update the study, since the Preparatory Commission was in a situation where positive developments were taking place which ensured the success of its deliberations and opened the way to the application of the Convention.

10. Roy Lee, in the introductory note prepared for International Legal Materials (vol. XXV, No. 5, September 1986), makes the following comment:

> "The Understanding is the most significant development in the Law of the Sea since the Convention was adopted."

This was achieved with the participation of all groups, signatories and non-signatories. As we all know, "Understanding" is one title given to the outcome of the negotiations concluded at United Nations Headquarters, New York, on 5 September 1986, through the efforts of the Chairman of the Preparatory Commission and the four pioneer investor countries - France, India, Japan and the Union of Soviet Socialist Republics - whose aims came into conflict when they submitted overlapping areas for registration. The first negotiations took place, as will be recalled, at Arusha, United Republic of Tanzania, on the initiative of Chairman Wairoba. The Understanding is thus the formal embodiment of the terms and conditions which led to a settlement of this controversial issue (LOS/PCN/L.41/Rev.1, annex).

11. All expressed their satisfaction at this achievement. As soon as the Understanding is put into effect and the first group of pioneer investors is registered, a new phase in the work of the Preparatory Commission will begin, and in relation to this issue, the Commission will have to find practical mechanisms for the purpose of opening the way to a dialogue with the countries that currently have difficulties with the part of the Convention dealing with sea-bed mining, in order to implement paragraph 12 of resolution II, which refers to the exploration of at least one mine site for the Enterprise, to the acquisition or development of the necessary technology and to the training of personnel for the Enterprise.

DOCUMENTS AND PROPOSALS ALREADY SUBMITTED

12. The joint venture has been a favorite topic for discussion in connection with the Law of the Sea at the United Nations since the work of the Third Conference. The first Austrian working document, entitled JEFERAD, contained an analysis of the proposals and studies made during the time of the Ad Hoc Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor Beyond the Limits of National Jurisdiction which was not included by the Secretariat in document LOS/PCN/SCN.2/L.2. This document is available from the Secretariat on request.

13. The Preparatory Commission has prepared other documents and proposals which relate to the present study. Among them, mention should be made in particular of:

(a) The Secretariat document "Information note on elements of joint ventures" (LOS/PCN/SCN.2/WP.3);

(b) The document "Project profile of a deep sea-bed mining operation by the enterprise" (LOS/PCN/SCN.2/WP.6 and annex I), as well as the outline of prospecting and exploration rules;

(c) The working document on a model joint venture agreement for sea-bed mining (LOS/PCN/SCN.2/WP.5), submitted by the delegation of the Federal Republic of Germany;

(d) The proposal on joint ventures submitted by the delegations of Belgium, France, Germany, Federal Republic of, Italy, Japan, Netherlands and the United Kingdom (LOS/PCN/SCN.2/WP.4);

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best copy available

(e) The three documents on JEFERAD prepared by the delegation of Austria (LOS/PCN/SCN.2/L.2 and Add.1 and Rev.1);

(f) The two memoranda submitted by the Asian-African Legal Consultative Committee;

(g) The Australian working paper (LOS/PCN/SCN.2/WP.10);

(h) The Understanding adopted by the Preparatory Commission on 5 September 1986 (LOS/PCN/L.41/Rev.1, annex, 11 September 1986).

14. The purpose of the present study is to conduct a further analysis of the proposal relating to the joint venture on the basis of the above and related documents and proposals, and in so doing to place special emphasis on exploration, research and development and the training of personnel, the components of the mandate given in paragraph 12 of resolution II.

15. Nevertheless, with a view to affording an overview of the whole range of activities, options are submitted for the development of a joint venture covering the entire field of work from prospecting to marketing, since, as is obvious, all the phases interact with each other and if there were really doubts as to the eventual economic viability of the enterprise in the long term, there would be no point to carrying out the first phase of exploration, research and development.

16. Three situations then need to be borne in mind, namely:

(a) Forecasts and calculations dealing with the final phases of production and marketing are necessarily highly speculative;

(b) The question whether - and when - ocean mining operations will be possible is not a purely economic problem, but a political-economic issue. The outcome will depend on the political decision taken by today's leaders. The Preparatory Commission, for its part, has to comply with the mandate given by resolution II, ensuring that the enterprise keeps pace with the level of development reached by countries and other bodies, and that the enterprise begins to operate effectively as soon as possible;

(c) The Enterprise, once established, must have the power to take its own decisions, and nothing that happens during the first phase, before the entry into force of the Convention, must restrict the Enterprise, since that would be harmful.

I. QUESTIONS RAISED BY THE ANALYSIS OF PARAGRAPHS 14 OF THE UNDERSTANDING AND 12 OF RESOLUTION II

17. Resolution II relates to all of the pioneer investors, whereas paragraph 14 of the Understanding refers to the "first group of applicants". Is this to be interpreted as meaning that the "first group", made up of the four pioneers, France, India, Japan and the Soviet Union, should together discharge, jointly and simultaneously, the assistance, training and other obligations referred to in the

resolution? There is also an important difference between these paragraphs in that paragraph 12 of resolution II provides for reimbursement of the cost of exploration, whereas paragraph 14 of the Understanding makes no provision for any kind of reimbursement. Perhaps the latter forms part of a practical agreement the aim of which was to give the first investors the option of determining the part of the area they should assign to themselves as the area of first activities?

18. It is noteworthy that while paragraph 14 of the Understanding refers to assistance both to the Preparatory Commission and to the Authority, paragraph 12 of resolution II refers simply to work carried out "at the request of the Commission". Can this be interpreted as meaning that under the Understanding the assistance would take place in two phases, the first beginning with registration and ending with the entry into force of the Convention and the establishment of the Authority, and the second beginning with the submission of a work plan and covering the whole duration of work under the first mining project? In any event, the terms of the assistance referred to in the above texts, which are reproduced for analysis at the end of this section, will need to be negotiated, since simple reference to the text will not suffice.

19. During these negotiations, various possibilities will have to be studied by the group of pioneer investors and the Preparatory Commission. As a priority, the advantages derived from the joint venture and those conferred by the assistance will have to be determined. The issue of costs and benefits will again be an important factor in determining the necessary features of this co-operation. Purely financial analysis of profits is not the most desirable procedure, given the magnitude of the task assigned to the Authority.

20. This study gives a number of cost-benefit calculations for various options, taking into account different factors and systems of analysis and incorporating these into current trends in the administration of high technology. Paragraph 14 of the Understanding of September 1986 reads as follows:

> "Notwithstanding the provisions of paragraph 12 (a) (i) of resolution II, the first group of applicants will assist the Preparatory Commission and the Authority in the exploration of a mine site for the first operation of the Enterprise and in preparing a plan of work in respect of such a mine site. The conditions and extent of this assistance will be discussed and agreed to following registration, applying _mutatis mutandis_ the provisions of paragraph 7 (c) of resolution II."

This is a significant advance over paragraph 12 (a) (i), which reads:

> "Every registered pioneer investor shall carry out exploration, at the request of the Commission, in the area reserved, pursuant to paragraph 3 in connection with its application, for activities in the Area by the Authority through the Enterprise or in association with developing States, on the basis that the costs so incurred plus interest thereon at the rate of 10 per cent per annum shall be reimbursed."

21. In the light of the foregoing, we reiterate the questions raised in the first part of this section. They need to be clarified in order to shed light, at this stage, on the issue of the procedure to be followed.

II. IMPACT ON THE ENTERPRISE OF TRENDS IN OCEAN MINING

22. The Australian study (LOS/PCN/SCN.2/WP.10 and Add.1) arrives at the following conclusions:

> At the present metal prices, the mining of polymetallic nodules for cobalt, copper, nickel and manganese from the deep sea-bed is not a viable proposition, either for an Australian company or for the Enterprise; increases in metal prices, by at least 100 per cent of their present level, would be required to make the mining venture viable.
>
> Even if the metal prices rise significantly for a three Mt/year operation, the volume of output of cobalt especially, and also of ferromanganese and nickel, would have a significant effect on the market. The metal prices would probably go down and it would be doubtful whether all output could be sold at market price.
>
> The technology of mining nodules from the deep sea-bed has not yet been proved. For this reason, the venture must be considered high-risk and therefore a high discounted cash flow rate of return would be necessary in order to attract capital.
>
> With the present metal price levels and ratios between the prices, the Cuprion process is more attractive than pyrometallurgical process and the reduction ammonia leach process (see annex 1).

23. These conclusions are based on a considerable volume of facts and figures. The Preparatory Commission owes a debt of gratitude to the delegation of Australia for having assembled them. Nevertheless, we should like to make some comments on the bases taken in the Australian document for its calculations, and on its conclusions.

24. Paragraph 1 establishes that "either for an Australian company or for the Enterprise", the mining of polymetallic nodules for the extraction of copper, cobalt, nickel and manganese, on the basis of present metal prices, is not a viable project. The assumptions on which this conclusion is based are as follows:

(a) That the Australian company would be acting on its own, in the private sector; the Enterprise would, accordingly, also be treated as if it were a commercial company, operating on sound commercial principles, within the private sector;

(b) That the technology to be used would be by and large the currently existing technology, which still requires a great deal of research and development in order to be "proved" and commercially applied.

25. The study does not consider new advances in research and development that could give rise to new concepts in mining. In the discussion in the document, no account is taken of the fact that the productivity achieved through technology - which would be an alternative in the face of price increases - is a factor that would make ocean mining economically feasible. In fact, technological advances are not expected because the cost of research and development is too high for a company to assume it. In addition, it is possible that equal or more important advances may emerge in land mining technologies, which, once again, would make ocean mining an economically non-viable proposition.

26. At present, predictions of supply and demand in respect of marine resources and the land resources alternatives that do not take into account the degree of change through the evolution and consolidation of technologies or the probable emergence of new technologies overlook important factors that would affect the return on private investment in science and technology in the field of marine sciences (Miller Spangler, see para. 28).

27. Paragraph 2 is based on different hypotheses. Here we are to assume that the mining of the deep sea-bed is in reality economically feasible. Nevertheless, if done successfully, that would be, so to speak, "sawing off the branch we are sitting on", since it would lead to saturation of the market for certain minerals, especially cobalt and manganese, bringing prices down to a level at which, once again, ocean mining would be economically non-viable from an industrial capitalist standpoint, but not from the social utility standpoint embodied in the preamble to the Convention, which might be encapsulated in the aphorism "common heritage of mankind". Given the levels of mineral content in the nodules, on the one hand, and the magnitude of demand, on the other, these conclusions are not tenable.

28. Paragraph 3 indicates that the technology of mining nodules from the deep sea-bed has not yet been proved. For that reason the venture must be considered high-risk and therefore a high discounted cash flow rate of return would be necessary in order to attract capital. This conclusion, again, applies only to the private sector, which investment decisions are based totally or almost totally on the classic formula:

$$A = P \times R/C$$

where A is the probable risk of the decision to invest, P is the probability that the research will be successful, R represents the net returns for the company in the event that the research is successful, and C is the cost of the research and the implementation of its results (Robert E. Wilson, "The Attitude of Management Toward Industrial Research", Mechanical Engineering, January 1950; D. W. Hill, Cooperative Research in Industry, New York: Hutchinson's Scientific and Technical Publications, quoted in Miller B. Spangler, New Technology and Marine Resource Development, New York: Praeger, 1970).

29. The Director of the Center for Techno-Economic Studies of the National Planning Association of the United States, Mr. Miller Spangler, who, with the sponsorship of the National Science Foundation, the National Council on Marine Resources and Engineering Development and the United States Coast Guard, has

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directed technology evaluation and forecasting studies on marine resources development, describes, in his book entitled New Technology and Marine Resources (1970) a flow diagram of research and development (see figure 4).

30. The author points out that, in the case of research and development aimed at "modest short reach" improvements, most of the projects do not involve great technical risks. Yet most of the important potential developments in marine resources will require basically new products or process technologies rather than incremental improvements. The possibility of failure in these cases is very high, and the rate of failure has been estimated variously at between 7 to 1 and 20 to 1 and 40 to 1. The farther back in the process of invention we go, the more overwhelming the rate of failure.

31. It is necessary to understand the importance of establishing successive levels of research, since sponsorship by the Federal Government of an early stage of research may stimulate privately funded research and development at a later stage. Spangler also gives us models for the failure probability rate for each successive stage.

32. If through Federal sponsorship of basic research studies or fundamental engineering research, a theoretical or technical solution is attained, then there will be a substantial reduction in the economic risk and it in attaining a solution through additional complementary research performed by the private sector. State investment can provide a strong stimulus and induce private enterprise to invest substantial sums to develop commercial marine technologies. It is apparent that the public sector, in this case the Federal Government, is better able to assume the risks of research and development projects at an early stage than private enterprise.

33. Among other things, the criteria on which investment decisions are based differ considerably from the public to the private sector; thus, at the national level, decisions aimed at the public sector are determined, generally, by national interests and not so much by purely financial considerations. In the case of marine technology in the United States, according to Spangler, these criteria include:

(a) The costs and potential benefits to the United States economy, in the promotion of national economic well-being, including balance-of-payments considerations;

(b) Enhancement of national security;

(c) Co-operation with other States and groups of nations and with international organizations in marine science activities in order to promote the quality of international relations and attain other benefits of international co-operation;

(d) Preservation of the role of the United States as a leader in marine science and resource development, i.e., securing technological leadership;

(e) Expansion of human knowledge in the scientific field of marine areas and the marine environment;

(f) Advancement of education and training in marine science;

(g) Protection of health and property;

(h) Conservation of the resources of the marine environment and avoidance of unnecessary duplication of effort, facilities and equipment, i.e., efficient management in the field of the conservation of human, natural and capital resources;

(i) Promotion of benefits for mankind and enhancement of the well-being of society;

(j) Enhancement of the national image.

34. Spangler draws attention to the fact that private enterprise investments in oceanic research and development have so far been relatively limited in project size, owing to the high risk associated with large marine ventures. An appraisal done by commercial enterprises shows significant sums were invested in research. It would appear, however, based on information from sources outside the enterprises, and taking into account the high risk involved in many areas of potential marine resources development, that special Government measures would be required to encourage and support investment in ocean mining research. This, according to Spangler, is especially true for mining ventures with initial investments ranging from $US 10 million to $US 100 million.

35. A list of criteria governing the policies for investment in research and development could also be drawn up for the international public sector. International official investment for research and development in marine technologies should be based mainly on criteria which seek to promote the establishment of new and different forms of scientific and industrial co-operation. The aim would be to lower the costs of the investment to be made by the industrialized States, while ensuring that the third world countries are involved in the technological development process, thereby making a meaningful contribution towards closing the gap between the developed and developing countries. Were it without public sector support, private investment in research and development of marine sciences can, on balance, be expected to decline steeply; worse still, it could proceed at a slower pace of development than national interests would indicate.

36. The document submitted by Australia is a good example of a study which bears out and corroborates the theses advanced by Spangler. Manganese nodule mining is a high-risk venture based on very advanced technology and requiring huge investments in research and development. Considering the high risk involved in ocean mining, especially in the early phase, and the fact that it is not very viable, or not viable at all, in the short-term it would not be possible to induce Australian enterprise, or any other enterprise, to take a favourable investment decision. This statement remains as true today as it was 16 years ago, when Spangler wrote his valuable book.

37. It can also be said today, as it was said 16 years ago, that the situation would change drastically if we had official funds to support research and development in the initial phases of projects. Bearing in mind the teachings of past experience, a venture of this kind should structure all its activities in such a way as to attract generous public funding for the initial research and development phases. This would heighten the possibility of obtaining funding in subsequent stages, and serve as an investment incentive for enterprises like the Australian one.

38. The joint venture proposed in this study will develop a structure that is very well suited to this type of financing. Not only would this facilitate the venture's entry into operation at an early stage, it would also encourage the earlier start-up of deep sea-bed mining operations by the private sector. This would be an added stimulus to the launching of deep sea-bed mining industries.

39. In the light of this analysis, a number of questions arise: Why should we exert ourselves to launch ocean mining industries when prevailing market conditions offer no promise of good results? And if, through international public and private co-operation, we should manage to develop the necessary technologies, would there be a large enough market for these minerals? If, indeed, we were able to secure a firm place in this market, what would be the effect on land-based producers? Why not leave exploitation of this common heritage to future generations?

40. There are two very solid arguments for acting right now, and they are given below.

41. First, if we look at market trends, we must assume that past levels of prosperity will not be attained in the course of the next few generations. The technological developments of the modern industrial revolution have drastically reduced the demand for raw materials by providing substitutes derived principally from the production of new materials and from recycling processes. The impact this change is having on developing countries, which still rely on the export of these raw materials, is obvious and universally recognized.

42. This situation is aggravated by the fact that in this latest phase of the industrial revolution, the demand for cheap labour has declined at the same rate as the demand for mineral products. The resulting changes in the international market are of the same magnitude as the changes wrought by high technology within national economies. The former situation of the land-based producer countries finds its parallel in the current unemployment in industrialized countries. Naturally, the problem of unemployment in the developing countries cannot be resolved by curbing the development of technology. Nor can it be resolved by reverting to technologies of the past. What is really needed is a creative approach to the whole problem of unemployment and the international distribution of wealth. The only solution is to bring high technology to the developing countries, as rapidly as possible, and see that they begin using it in their economic activities. Some developing countries have already taken this decision and are pioneers in bringing about this change.

43. The institutional infrastructure of the United Nations Convention on the Law of the Sea, which attempts to ensure that all States benefit from the advances made

in the development of underwater mining, could serve as an effective mechanism for attaining the above objective. Little by little, these advances could be applied to other areas of the economy.

44. In all likelihood, metal prices will not rise enough in the near future to make deep sea-bed mining profitable. However, cost-effectiveness can be achieved by reducing the costs of technology.

45. Now is also the time to launch ocean mining industries, for if the success of an industrial activity were left solely to market influences, it would not have been possible to attain the advanced state of technology that exists today. We would have no nuclear industry, nor would we have the space industry, the laser industry or industries based on micro-electronics and biotechnology. Even the Government of the United States, committed as it is to the free enterprise system, finances more than 50 per cent of all research and development activities in high technology. This has given rise to the large research and development consortia which are not at present subject to the anti-trust laws and regulations referred to in the National Cooperative Research Act of 1984. This legislation reflects a process which had its beginning at the time of the Second World War and to the public financing initiatives taken by President Roosevelt's Administration.

46. This brings us back to the question whether official investment was the right solution. The answer is: "That was the decision made and there is no other alternative." It is incumbent upon us to try to maximize the benefits of this policy and, as much as possible, to mitigate the problems created by new technologies, perhaps by restructuring national and international markets.

LOS/PCN/SCN.2/WP.14/Add.1
26 March 1987
ENGLISH
ORIGINAL: SPANISH

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TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2
Fifth session
Kingston, Jamaica
30 March-16 April 1987

THE INTERNATIONAL VENTURE

(Study submitted by the Republic of Colombia)

Addendum

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III. THE CHANGING STRUCTURE OF RESEARCH AND DEVELOPMENT FINANCING

In the past, and particularly during the nineteenth century, the typical inventor was a person of genius; he was the driving force of technological innovation. He usually came up with an invention and then brought it to an industrial entrepreneur, who frequently exploited this invention for his own benefit. Then, patent laws were introduced to protect poor scientists and enable them to enjoy the fruits of their talent and labour.

In the twentieth century, this situation began to change. The modern corporation began to hire groups of scientists and the individual inventor has gradually been disappearing, to be replaced by groups of salaried scientists or geniuses; the results of their creative work are now the property of the corporations or enterprises concerned.

National corporations and recently multinational corporations are now considered to be the driving forces of technological progress. However, this situation has begun to change in the second half of the twentieth century because the costs of high-technology research and development have increased substantially and even the large multinational corporations are reaching the limits of their capacity to produce this type of technology.

Banking institutions have been obliged to become involved in the process and to participate in financing research and development. In addition to banks, Governments have also had to participate in such financing. Inventions financed by official funds are often public property and are therefore considered to be part of the heritage of mankind.

Of course, patent legislation intended to protect the rights of individual inventors in simple economies is not applicable in this new context and the whole area of intellectual property is currently in a state of decline, under the impact of scientific changes in the modern industrial system, which in turn has been weakened by the technologies produced by the system itself (Xerox, video-cassettes, etc.).

Certainly, such changes, fundamental to research and development within the corporate sector, necessarily have an effect on the enterprise system in its entirety. The age of the private corporation - classic, centralized and autocratic - be it national or international in character, is coming to an end.

The structure within which enterprises are evolving has a much larger component of social responsibility, public participation and community control. This evolution is mainly determined by financial aspects and technological progress, and by new environmental schemes and the major social changes of our time.

Perhaps the final stage in the development of high-technology research is represented by the new mechanisms of international public and private co-operation, since research and development costs are currently so high that they pose problems for the private sector for most countries acting on their own.

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The European Community projects EUREKA and ESPRIT are a good example of this new order of international co-operation. The EUREKA project has a simple administrative structure with three levels: national co-ordinators, a council of national co-ordinators and a conference of ministers.

In order to obtain the necessary financing for a research project, enterprises take the following action. They first submit a joint proposal or project to the national co-ordinators in their respective countries, who study the proposals and make a preliminary selection. This selection is then submitted to the Council consisting of all the national co-ordinators for consideration and refinement. Finally, the proposal is submitted to the Conference of Ministers, who take the final decision. When the proposal has been approved, half the financing is borne by the industrial enterprises which submitted it. The other half is borne by the participating countries and by the European Economic Community. Technological developments produced under the auspices of EUREKA involving shared financing are the property of the European Community and are available to the States and enterprises that participated in the project.

With the support of the organization established for EUREKA, three projects are currently being implemented in the ocean-industries sector. The first of these is a project to develop the high technology required for the design and construction of industrial fishing vessels. The second, entitled EUROMAR, aims to develop and apply new technologies for exploring environmental relationships and their chains of cause and effect in the European seas. EUREKA, with the collaboration of marine researchers, planners and the industrial sector in general, will design models for the scientific monitoring of natural changes and changes caused by human action, which may be physical, chemical or biological in nature and which are causing major problems in the seas of the European continent. In addition, the project is intended to identify strategies for conducting research and finding scientific and technical solutions. The third project will develop an acoustical system. Unfortunately, mechanisms such as these, designed to promote high-technology research and development, are almost exclusively confined to the industrialized countries. EUREKA is a project for the countries of the European Community. There do exist, however, other consortia and joint ventures to promote research and development. A large part of United States research and development is being carried out in other countries. All of them are industrialized countries. A few figures will serve to illustrate this situation: less than 3 per cent of all funds invested in science and technology throughout the world is allocated to projects being executed in the developing countries. At present more than 90 per cent of scientists and experts live in industrialized countries and 93 per cent of all patents are taken out in those countries. This imbalance in scientific production is even more marked in the area of marine technology. The technological gap between countries is undoubtedly the most dramatic imbalance in the area of economic and social development.

Bearing in mind the enormous importance of research and development for industrial development and national security and their impact not only on present-day societies but on the societies of the future, it is vital to make a great effort to find mechanisms that will ensure that this gap is closed as quickly as possible.

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IV. ALTERNATIVE FORMS OF PARTICIPATION BY PIONEER INVESTORS

In the context described above, we wish to analyse some of the proposals and arrangements which we have borne in mind in establishing a model for the proposed joint venture.

Under our proposal, the joint venture should undertake the various activities of an integrated mining project ranging from the exploration of mining areas to the marketing of mining products. It would obviously be much more adventageous to be able to restrict mining activities at the initial stage to exploration and exploitation of the first mine site or sites; if various mining sites are considered, we shall have to make projections for a distant future which will necessarily be of little concern at the beginning.

On the assumption that we shall be working at the pioneer site, we must organize our joint venture in such a way that it can be developed in two distinct phases. During the first phase exploration would take place - probably in the Central Pacific, which for the group of pioneer investors, with the exception of India, would be the most economical to explore, because it is situated relatively close by and because the prospection phase has already been completed there.

India would have the options either of co-operating with the other pioneer investors, advising the Preparatory Commission in the work it is carrying out in the Central Pacific (an option which would allow it to acquire valuable experience), or of working in a neighbouring area in the Indian Ocean and offering the Preparatory Commission its collaboration in that area. Such an offer would also be of great interest to the Commission, immediately or for the future.

We shall analyse each of the possible options which might be implemented in the Central Pacific zone.

Option 1. Each member of the group of pioneer investors will continue individually to explore the part of the mine site adjacent to its own belonging to the Enterprise. In the document submitted by Australia it is estimated (on the basis of the figures published by Hillman and Gosling in 1985) that the cost of exploring the Enterprise's mine site would be $US 21.1 million.

In addition, the document mentions that "detailed exploration of the resource will be required before a decision is taken to build the mining ships, transport ships and process plant. This will require ship charter for a survey by marine geologists to make a detailed evaluation of reserves. The exploration will have to determine the areal variations in the abundance of the nodules, the areal variability of the grade of all four metals and the topography of the mining surface".

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OPTION 1

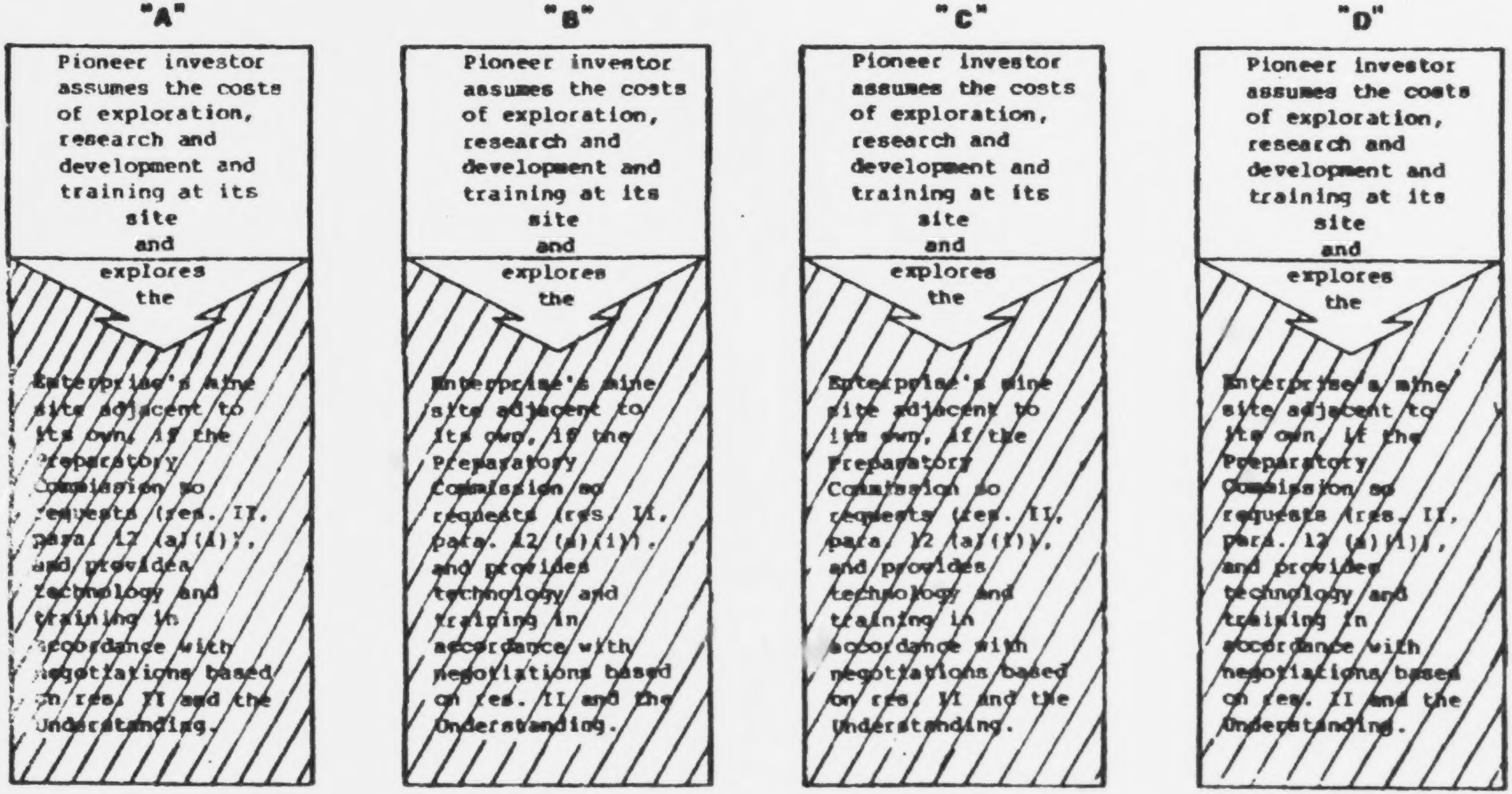
"A"
Pioneer investor assumes the costs of exploration, research and development and training at its site and explores the
Enterprise's mine site adjacent to its own, if the Preparatory Commission so requests (res. II, para. 12 (a)(i)), and provides technology and training in accordance with negotiations based on res. II and the Understanding.
"B"
Pioneer investor assumes the costs of exploration, research and development and training at its site and explores the
Enterprise's mine site adjacent to its own, if the Preparatory Commission so requests (res. II, para. 12 (a)(i)), and provides technology and training in accordance with negotiations based on res. II and the Understanding.
"C"
Pioneer investor assumes the costs of exploration, research and development and training at its site and explores the
Enterprise's mine site adjacent to its own, if the Preparatory Commission so requests (res. II, para. 12 (a)(i)), and provides technology and training in accordance with negotiations based on res. II and the Understanding.
"D"
Pioneer investor assumes the costs of exploration, research and development and training at its site and explores the
Enterprise's mine site adjacent to its own, if the Preparatory Commission so requests (res. II, para. 12 (a)(i)), and provides technology and training in accordance with negotiations based on res. II and the Understanding.

FIGURE 1

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The figures put forward in the JEFERAD document are a little higher - $32.4 million; the Secretariat document LOS/PCN/SCN.2/WP.6 establishes costs of $US 27 million for the exploration phase. Nevertheless, for our purpose it is not so important to determine the exact cost. We may assume the cost of exploration to be X. The point is that, in the case of:

$$3 \times \frac{X}{3} \quad \text{or} \quad 4 \times \frac{X}{4}$$

the value of X would be multiplied by the number of times that the operation is repeated.

Generally speaking, there will probably be additional costs of at least 30 per cent because of possible duplication of efforts. There may be more than one ship working, with inevitable duplication of personnel and multiplication of administrative costs. Lastly, as exploration activities are completed, there will inevitably be information from three or four sources to be registered, organized, processed and interpreted.

As an illustration, let us assume that, in the absence of negotiation between the pioneer investors and the Preparatory Commission, it is agreed that the Enterprise will pay half the costs incurred by the pioneer investors plus 10 per cent interest as soon as the exploration programme, which will last six years, is completed. This will cost the Enterprise approximately $US 35 million. Thus the amount of funds needed for exploration would rise to $US 75 million instead of $US 30 million, which would be the cost if the Enterprise undertook its own exploration directly. (This figure is not quite correct, since the $US 35 million represent the sum of money that the Enterprise would pay towards expenses incurred and the estimated real cost of exploration is approximately $US 40 million.)

As to research and development and training activities, the duplication and confusion would probably be even greater, since each pioneer investor would have to carry out a complete programme independently. The costs of research and development, according to the Australian document, are estimated at $US 167.8 million for a period of seven years, or $US 83.9 million for the first five years.

The JEFERAD document estimates an amount of $US 167.7 million for this activity over a period of five years. All these figures have intentionally been calculated at the maximum since, as we have seen, technological innovation and the development of new mining concepts provide a solid basis for reducing the costs of activities in the periods following the mining. Secretariat document LOS/PCN/SCN.2/WP.6 estimates that $US 123 million will be required to implement this programme from 1988 to 2000.

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In any case, if three or four research and development activities are planned simultaneously and independently, the total cost for the first five-year period could triple, to $US 250 million. Of course, there is a possibility that competent research and development could result in greater productivity, which is very difficult to assess or quantify.

The training of three or four equal groups of personnel in independent and separate programmes could increase training costs by 50 to 100 per cent compared to the cost of training a single group in a specific and unified programme. Admittedly the above analysis is not the best way to make a cost-benefit analysis for the exploration of the mine site by the Enterprise or to plan the research and development and training programme adequately.

Option 2: In this second option, the pioneer investors would join together and form a joint venture which would promote the exploration of the first mine site for the Commission and would carry out research and development activities; at the same time, it would be responsible for personnel training.

Here, as the Secretariat thoroughly demonstrated in its documents LOS/PCN/SCN.2/WP.3 and WP.6, there are many alternatives (contractual ventures limited ventures, etc.), and the pioneer investors would of course have to decide on the type of alternative to be pursued.

It should be recalled, however, that it is the first phase of research and development which presents the greatest risks.

In a recent article entitled "Strategic financial planning in public enterprises in developing countries: The capital structure issue" by Riyaz H. Bokhari, Auditor General of Pakistan, in Public Enterprises (vol. 6, No. 4, 1986), the following observation is made:

> "The greater the risk attached to a venture, the more desirable is it to find the finances from equity sources. A heavy investment of loan funds in a research project which is unsuccessful can have a much more serious effect on the enterprise than a similar loss of risk (equity) capital."

We could visualize a situation in which the pioneer investors agree to finance, among themselves, both the investment and operational cost of a joint exploration project. This project could cost an estimated $US 21 to $US 31 million; expenditures required for research, development and training activities would amount to $US 167.6 million for a period of activity of five years; for reasons already explained, we have assigned the highest possible cost to these activities. In the pre-investment period, it is estimated that the cost of training could reach $US 24 million. We can also assume that total investment for each of the pioneer investors would be shared by them and their Governments, since, as we noted above, it appears unlikely - or impossible - that a private company could assume the high risk involved in underwater mining.

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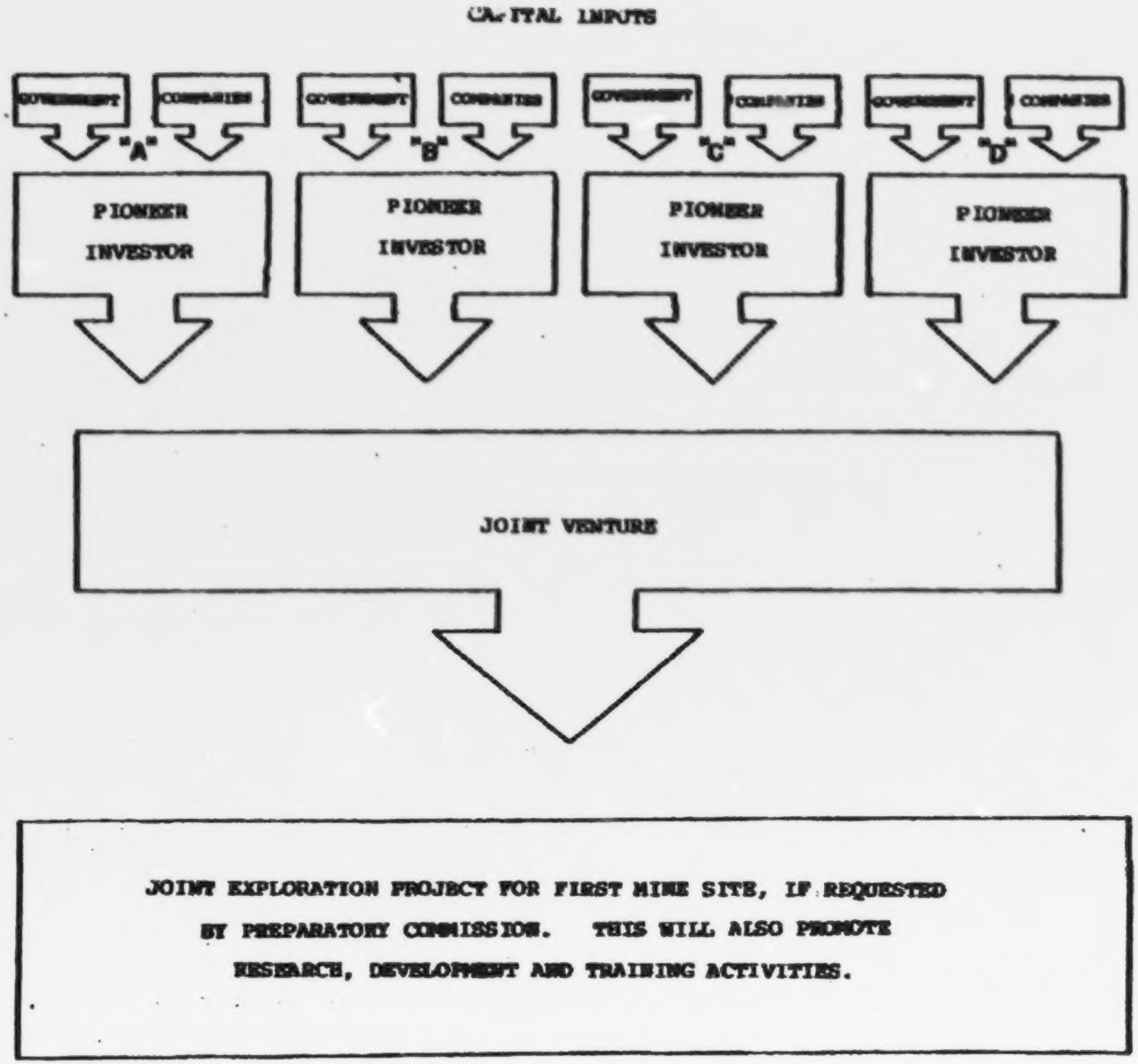
CAPITAL INPUTS
GOVERNMENT
COMPANIES
"A"
"B"
"C"
"D"
PIONEER INVESTOR
JOINT VENTURE

JOINT EXPLORATION PROJECT FOR FIRST MINE SITE, IF REQUESTED BY PREPARATORY COMMISSION. THIS WILL ALSO PROMOTE RESEARCH, DEVELOPMENT AND TRAINING ACTIVITIES.

FIGURE 2

/...

During the second stage, which would begin after the Convention enters into force, the Enterprise could become a part of the joint venture, or could decide to form a separate organization to develop mining activities independently.

In any case, in order to initiate the activities, the Enterprise would have to pay half the cost of exploration, an amount which could reach a maximum of $US 15 million; with annual interest of 10 per cent over six years, this would give an approximate total of $US 26.7 million. When the Enterprise began to operate, it would naturally not have been able to carry out any research and development activity directly. It would therefore have to obtain the technologies it needed from the partners in the joint venture; these technologies could have been developed by the pioneer investors individually or jointly over the five preceding years. If the Enterprise should decide to proceed independently to create another joint venture, the cost involved in research and development would probably be at least the same as the cost to the pioneer investors, plus the above-mentioned 10 per cent interest over six years, which represents a total of $US 295.85 million.

Let us suppose, on the other hand, that the Enterprise joined with the pioneer investors to form a joint venture. In this case, it would pay only half the costs of research and development, or $US 80 million, to which would have to be added, as we have seen, the 10 per cent interest over six years; the total figure would then be $US 141.7 million.

The second option appears more favourable than the first, of course, since the costs of exploration and research and development - activities which the Enterprise would need to carry out through the Preparatory Commission during the years prior to the Convention's entry into force - would be much lower. This could also be more favourable to the Enterprise: upon the entry into force of the Convention, it would be in a more solid position, for its debt would be much lower than under the first option. However, it should not be forgotten that the costs to States individually and to the companies involved would under any circumstances be much greater because the operations to be completed in this first phase run a high risk of failure.

Option 3: For this option, we envisage a venture in which the pioneer investors each contribute an equal amount of money, this investment being supported by additional inputs of international public funds. We also assume that the pre-investment costs are approximately $US 200 million for a period of five years (the Australian document, as well as that of JEFERAD and Secretariat document LOS/PCN/SCN.2/WP.6, estimate approximately this amount).

To finance this venture, a way would be sought to obtain international public funds from institutions such as the World Bank or one of its associates, or the United Nations Development Programme or similar bodies.

Another alternative could be to issue bonds which would be sold in a market of small investors. We believe that there would be great interest throughout the world in acquiring bonds from an enterprise which deals with the appropriate use of mankind's common heritage.

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OPTION 3

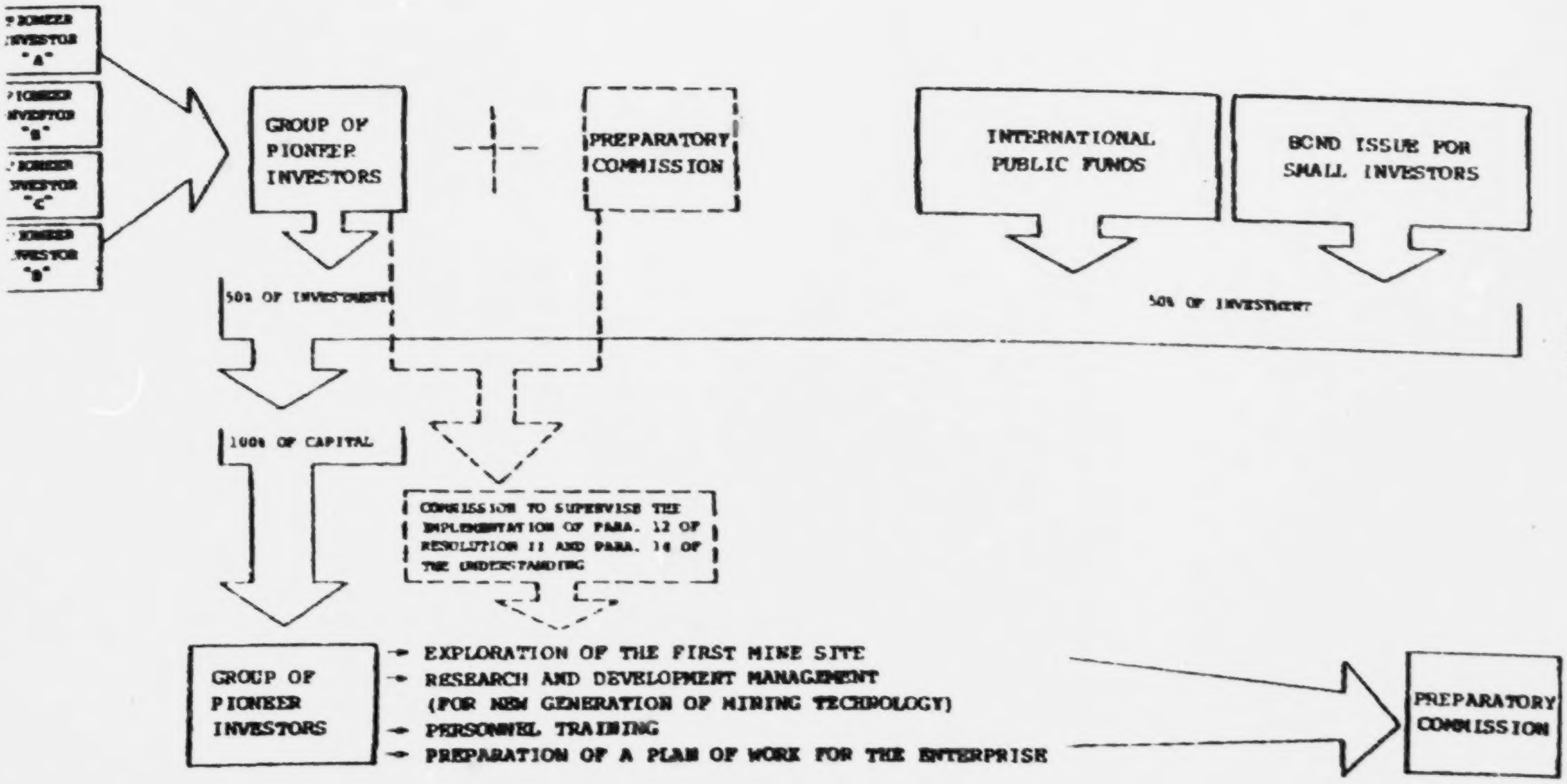
PIONEER INVESTOR "A"
PIONEER INVESTOR "B"
PIONEER INVESTOR "C"
PIONEER INVESTOR "D"
GROUP OF PIONEER INVESTORS
PREPARATORY COMMISSION
INTERNATIONAL PUBLIC FUNDS
BOND ISSUE FOR SMALL INVESTORS
50% OF INVESTMENT
50% OF INVESTMENT
100% OF CAPITAL
COMMISSION TO SUPERVISE THE IMPLEMENTATION OF PARA. 12 OF RESOLUTION II AND PARA. 14 OF THE UNDERSTANDING
GROUP OF PIONEER INVESTORS
→ EXPLORATION OF THE FIRST MINE SITE
→ RESEARCH AND DEVELOPMENT MANAGEMENT (FOR NEW GENERATION OF MINING TECHNOLOGY)
→ PERSONNEL TRAINING
→ PREPARATION OF A PLAN OF WORK FOR THE ENTERPRISE
PREPARATORY COMMISSION

FIGURE 3

/...

If it is decided to resort to the World Bank or the United Nations Development Programme, the funds could be obtained as a long-term, very low-interest loan, or as risk capital. As noted in the JEFERAD document, this would not be a very large sum compared to the big investments which have been made in other mining or energy enterprises. However, this small amount of international capital would be the factor which would make the joint mining venture extraordinarily attractive to any private or State body desiring to invest in ocean mining. Moreover, international capital support would be an incentive to the launching of this mining industry, because it would considerably increase the likelihood of commercial viability in the later stages.

In the option presently being analysed, assuming that four investors participate, the cost to each of them, over a period of five years, using the figures already presented, would amount to a total of $US 25 million, representing an annual investment of $US 5 million. Similarly, the contribution from the World Bank or from international agencies would be $US 20 million per annum. These funds would be given to the joint venture on behalf of the Preparatory Commission. The international inputs would make it possible for the Enterprise to begin operations as soon as possible, with the full participation of the developing countries. As noted in the JEFERAD document, which based its analysis on the proposals of the Asian-African Legal Consultative Committee (AALCC), a commission could then be formed of representatives of the Preparatory Commission and the pioneer investors to supervise the implementation of paragraph 12 of resolution II and paragraph 14 of the Understanding of 5 September 1986. The joint venture would explore the mine site owned by the Enterprise and would discharge the obligation of training personnel and carrying out research and development activities on the scale needed to create new mining concepts. These scientific activities would seek to create a new generation of mining technology to enable the processes being used on the sea-bed to be completely automated and run by remote control. In addition, the joint venture would prepare the plan of work for the Enterprise. All these activities would be financed through pre-investment budgets.

Thus, upon the entry into force of the Convention, this first phase of the joint venture would already have been completed, and the Enterprise would, at worst, have only a small obligation at the beginning, that of paying the cost of the exploration. Let us also envisage that an arrangement could be made similar to that of the United Nations Revolving Fund for Natural Resources Exploration; in this case, the Enterprise would have to pay, for the loan, only 1 per cent of the value of the minerals produced during a period of 15 years; and this would necessarily be a modest obligation.

At worst, the Enterprise would not own the equipment used to explore its first mine site, but it would be co-owner of all the technologies developed by the joint venture, since 50 per cent of the research and development activities would be financed by international public funds, which would be given to the joint venture on behalf of the Preparatory Commission and the new body, called the Enterprise (see figure 5).

FIGURE 4

PRE-INVESTMENT COSTS FOR THE DEVELOPMENT OF THE FIRST MINE SITE FOR THE ENTERPRISE

(millions of $US)

	Exploration costs		Research and development costs		Training costs		Total	
	Pioneers	Enterprise	Pioneers	Enterprise	Pioneers	Enterprise	Pioneers	Enterprise
Option 1	40(1)	35.43(2)	250	442.89(4)	36(5)	-	326	478.32
Option 2	30	26.57(6)	167	295.85(7)	24	-	221	322.42
Option 3	15	15	835	83.5	12	12	110.5	110.5

(1) An increase of 30 per cent is assumed on the basis of the exploration cost of $US 30 million.

(2) It is assumed that the Enterprise will reimburse half the exploration costs, plus 10 per cent interest over six years.

(3) For duplication, an increase of 50 per cent is calculated on the basis of $US 167 million.

(4) It is assumed that the Enterprise purchases the technology developed by the pioneers at a fair commercial price, calculated on the basis of the cost to the pioneers plus a 10 per cent profit, over six years.

(5) It is assumed that the basic cost of training is $US 24 million over six years. An increase of 50 per cent is assumed for duplication of efforts, personnel, installations, etc.

(6) It is assumed that the Enterprise will reimburse half the exploitation cost, plus 10 per cent interest over six years.

(7) It is assumed that the Enterprise purchases the technology, as in (4).

(8) It is assumed that half the pre-investment costs are provided by the funds of an international agency, to be paid by the Enterprise, without interest or at a very low interest rate.

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In any case the joint venture should be undertaken in accordance with the rules and regulations adopted by the Preparatory Commission for the prospecting and exploration stages.

Similarly, if the indications contained in paragraph 14 of the Understanding or in the first, second or third versions of the JEFERAD scheme are followed and if the provisions of these documents are respected, the activities could be undertaken before the Convention enters into force. This arrangement would make it possible to separate the first phase, in which exploration, research, development and training would be undertaken, from the subsequent phase of production, processing and marketing. This arrangement would also work if there was to be an integrated mining project.

With regard to the problem of the redistribution of benefits and, in particular, the ownership of the technology developed jointly, there are several possible options. If the members of the joint venture decide to to remain together and to include the Enterprise as one of the partners, there would be no problem. The new entity would submit a plan of work which would necessarily be prepared in accordance with paragraph 14 of the Understanding.

The debts and profits resulting from the first phase will be distributed in the manner established in annex III, article 5, of the Convention, which contains detailed recommendations on the procedure for the transfer of technology that is to take place at the time when the plan of work is submitted for consideration.

It will be recalled that it was because of that article that some industrialized countries had difficulties in signing the Convention.

If the applicant is a joint venture for research and development, of which the Enterprise is a part, the application of the above-mentioned article would be simplified considerably and the problems and difficulties which some industrialized States encountered in relation to the transfer of technology under the Convention would no longer exist.

If, on the other hand, the partners decide to terminate their relationship for any reason whatsoever (one likely cause could be the failure of the joint venture), the following situations could arise:

(a) The joint venture failed in its attempt to produce technologies of any value; in this case, any profits or debts would be distributed proportionately between the various investors and the joint venture would thus be terminated.

(b) The joint venture succeeded in developing technologies and inventions for which patents were granted. Much has been written about how to distribute the inventions of research and development consortia or the patents which they may have taken out, when it is necessary to terminate the contract. Such achievements include "fundamental research, applied R&D, prototype development, pilot plant demonstration, standards research, and testing and measurement in natural science and engineering" ("Co-operative R&D for competitors" by Herbert I. Fusfeld and Carmela S. Haklisch, Harvard Business Review, November-December 1985). "The newer groups emphasize the development of a stronger technical base to improve productivity and enhance international competitiveness. Their thrust is 'precompetitive', or more accurately, 'procompetitive'".

Everything that was jointly developed becomes the property of each of the participants, who after some time has elapsed should be free to transfer such technologies to third parties.

Another method of analysing this effort should have the basic goal of closing the gap existing between countries in the field of research and development and stimulating North-South co-operation in the field of industrial technology applied to marine activities.

The best way of doing this would be through the application of article 276 of the Convention, which recommends the establishment of regional marine scientific and technological research centres.

The United Nations Environment Programme (UNEP) is currently studying the possiblity of establishing centres as part of its Regional Seas Programme, for which a feasibility study is being conducted for the Mediterranean area. The United Nations Industrial Development Organisation (UNIDO) has published a document on trends and results in the development of marine industrial technology, which recommends the establishment of such centres. UNIDO has just commissioned a second study, dealing with the organization of the marine scientific and technological centres.

The problems involved in the establishment of these centres are similar to those encountered for the establishment of the Authority, including the creation of a joint venture as the nucleus of the organ.

In present circumstances, when the United Nations system is facing an acute financial crisis, it would be quite inappropriate to propose the creation of new international entities. Governments are unable and unwilling to make the investments required for new organizations.

We are convinced that the real need is not for new institutions but for a new concept of international co-operation for scientific and industrial development. A new approach is needed to stimulate investments in the private sector and directly increase industrial productivity. In other words, we believe that these regional centres, like the joint venture for research and development and like the Enterprise of the Authority, should be organized on the basis of the EUREKA principles and of financial co-operation between industry, Governments and international organizations.

If we assume that the network of centres for the industrial development of marine technologies is created, the joint venture for ocean mining, probably located in Jamaica where the Authority has its seat, would be part of this network; if this project were to end, any deed of ownership of the joint venture could easily be transferred to other research centres, one of which would have to be located in the Caribbean as part of the regional seas programme in that region.

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The above comments necessarily relate to the future - possibly to the beginning of the next century. This also involves the implementation of the most important aspects of the Convention, which are of special interest to the developing countries and for the construction of a new international economic order needed for the benefit of both developed and developing countries.

This third option offers benefits at a relatively low cost and gives the Preparatory Commission and the developing countries an opportunity to participate passively and separately in research and development.

Option 4: Under this option, a Sui Generis Model Entity would be set up, consisting of the group of pioneer investors and the Preparatory Commission. This entity would receive an injection of international public funds through the Preparatory Commission. It would also be assumed, as under option 3, that pre-investment costs would amount to approximately $US 200 million.

The Model Entity would be funded from inputs from the group of pioneer investors in the form of working capital and technology, as described in annex III, article 5, paragraph 8, and from the Preparatory Commission as an international legal entity, which would provide international public funds and represent the rights of mankind, recognized in the Convention.

The Model Entity would function as a transitional enterprise and its activities would continue without interruption those of the International Polymetallics Enterprise (IPE), when it is legally constituted.

The Model Entity would have the mandate specified in paragraph 12 of Resolution II, paragraph 14, of the Understanding and articles 275 and 276 of the Convention, consisting of:

(a) Personnel training: on-the-job training
formal training;

(b) Transfer of technology and technological innovation;

(c) Environmental impact studies;

(d) Exploration of the site of pioneer mining activities;

(e) Relevant studies and administrative, technical and economic designs for the organization of the Enterprise, including the plan of work.

Personnel training is of crucial importance for ensuring the independence and autonomy of the Enterprise, which would be a vital tool for achieving minimum levels of productivity and efficiency, enabling the Enterprise to be internationally competitive in the complex mineral market.

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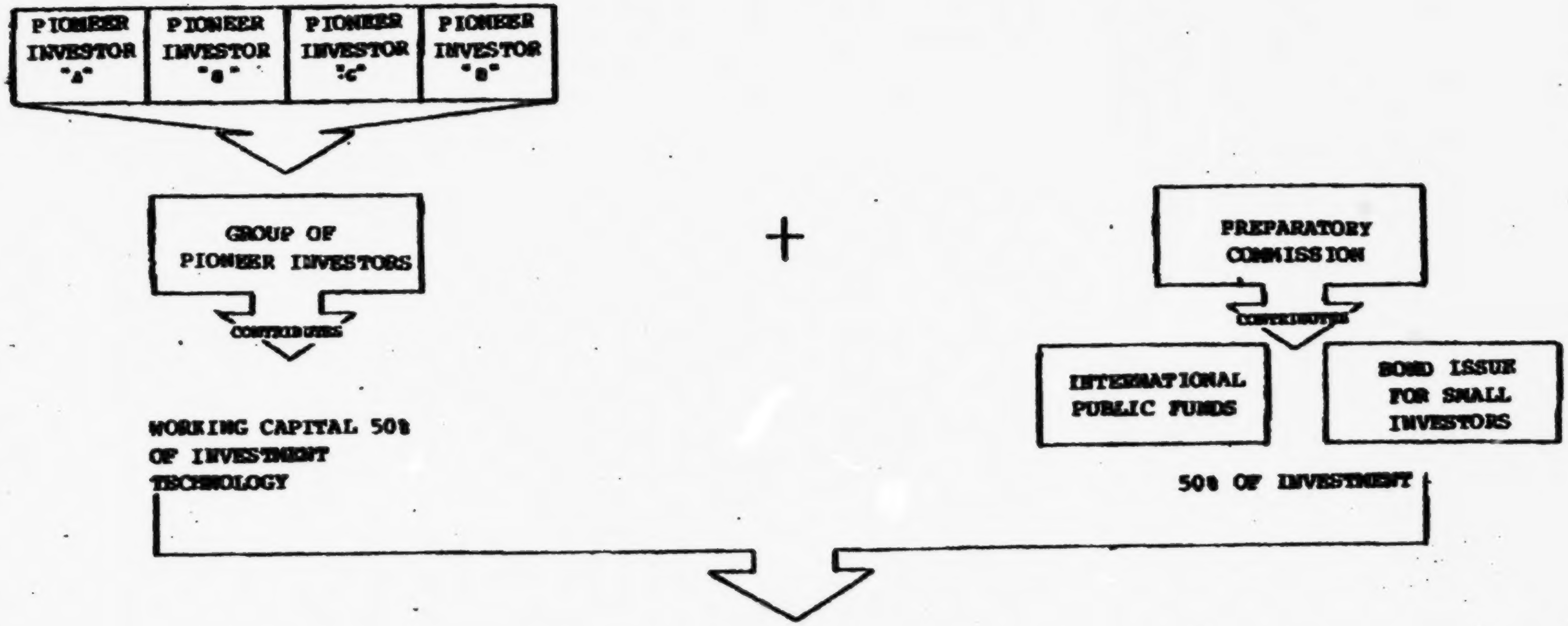
OPTION 4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PIONEER INVESTOR "B"
PIONEER INVESTOR "C"
PIONEER INVESTOR "D"
GROUP OF PIONEER INVESTORS
CONTRIBUTES
WORKING CAPITAL 50% OF INVESTMENT TECHNOLOGY
+
PREPARATORY COMMISSION
CONTRIBUTES
INTERNATIONAL PUBLIC FUNDS
BOND ISSUE FOR SMALL INVESTORS
50% OF INVESTMENT

ACTIVITIES OF THE MODEL ENTITY

- Exploration of the first mine site
- Personnel training
- Transfer of technology, scientific research and technical innovation
- Environmental impact studies
- Design of models (plan of work) for the future Enterperise

The Convention

- enters into force

FIGURE 5

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Because this activity is extremely costly for the parties, a way must be found to absorb this cost; arrangements must therefore be evolved to facilitate the training of the personnel which the Enterprise needs in all specialities and at the highest possible level.

The arrangement often used by transnational companies in developing countries, which has proved beneficial to those countries (particularly in the hydrocarbons sector), is on-the-job training, in which the firm recruits local staff for its operations and trains them as they work for the transnational corporation.

To the benefit of many countries, this method has been used to train, at no cost to the country and at manageable cost to the multinational corporation, almost all the human resources in enterprises which are now owned by the Governments concerned.

In the case under consideration, the personnel training process could be carried out through this arrangement, in which each of the pioneer investors would honour its training commitment by recruiting 25 per cent of its labour force for its activities at the sites of pioneer activities from highly qualified third world personnel. Training would be provided at all levels and in all specialities. The staff would be selected by the Preparatory Commission, through the group of experts, from trained staff existing in the developing countries who had already been recommended to the Commission by their respective countries. As a result of the efforts of technical and scientific co-operation made by the industrialized countries after the Second World War, a large group of technicians and professionals from third world countries was trained at the best academic research centres; these people are largely underemployed in their respective regions. This high-quality resource could easily be retrained to perform other functions. In view of the level of wages in the developing countries and the fact that these people would be recruited on a temporary basis as trainees, they could be paid 50 or 70 per cent of the wages paid in the industrialized countries. It should be borne in mind that, because this is a new branch of mining for which no specialized staff exist on the labour market, the pioneer investors would have to provide on-the-job training programmes for all their staff and not only for the 25 per cent recruited from the candidates offered by the Commission. Similarly, the technicians and specialists from the third world would be highly motivated by at last having an opportunity for achievement at a high level, and this situation would guarantee maximum productivity in the performance of their work.

After a sensible waiting period, both for technicians and for managers, administrators, negotiators and others in the decision-making sector, this labour force should be incorporated within the Enterprise in a well structured programme agreed previously with the group of pioneer investors.

Because of the speed of technological innovation and the high degree of specialization required, a formal training process, to be provided primarily at universities, is needed in many fields. For these cases, use could be made of the industrialized countries' technical co-operation agencies, which could work with the Preparatory Commission and then with the Authority to select the most suitable

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centres for the training required and allocate 5 per cent of the fellowships already existing in their programme of international technical co-operation to train the senior personnel needed by the Preparatory Commission and the Authority. This percentage is too small to affect the programmes being implemented by the international agencies. When combined with the contributions from the sum of international technical co-operation, however, it would represent an important effort and a significant amount if one considers periods of 5, 10 or more years. In the initial phase, the main emphasis should be on the training of managerial cadres and of staff at decision-making levels, since they will soon have to start working on the design of the Enterprise and on the planning and organisational studies.

Similarly, training programmes should be offered in the countries to give leaders, politicians and entrepreneurs the necessary basic information about the Convention on the Law of the Sea, the Authority, the Preparatory Commission and the Enterprise, in order to win the acceptance and support of these groups for the future activities of the Preparatory Commission and of the Authority. This training could be given at short seminars organised by specialised centres such as the International Ocean Institute (IOI).

Transfer of technology and technological development

Technological advances are another fundamental factor in the development of current and especially of future enterprises and are the true driving force of progress. Experience gained in major contemporary research projects has demonstrated the great contribution of their technological programmes when applied to other activities. Space exploration, for example, has produced technoloies which, applied in other fields, have contributed significantly to producing change and achieving progress. Marine research, equally, is not only capable of creating the technologies to make marine activities easier and more efficient, but can open the way for many of these technologies to be applied to the processes of change and the search for progress in the developing countries. This represents a major effort of human intelligence to manage the ocean and to tap its resources. Much United States research and development is in fact being carried out in other countries, but they are all industrialised countries. Less than 3 per cent of all money invested in research and development is invested in developing countries, while more than 90 per cent of scientists and technicians live in industrialized countries and 93 per cent of patents are taken out in developed countries.

In view of these facts, we consider that there are two possible courses of action.

First course of action: the establishment of research programmes in the oceanographic sciences at research centres in third world countries, advised by the best-known research centres in the industrialised countries, has succeded in initiating this fundamental activity in some countries.

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The existing scientific research institutions in third world countries which were selected by the countries concerned to develop programmes in the oceanographic sciences will have already solved the problems of physical plant, financing, managerial personnel and support, so that a new activity such as marine scientific research would not irrevocably jeopardize the country' development.

The Preparatory Commission would choose from the centres selected by the countries those best suited to initiate the programmes and at the same time would request the collaboration of the research centres in developed States in conducting joint programmes in the various regions with scientists from the developing country centres. Meanwhile, it would arrange for the latter to help organize programmes at their respective headquarters in co-operation with the most qualified international scientists. The programmes in each region should meet the priority requirements for research and technological innovation identified by the Commission through the group of experts. Once the centres in the developed and the developing countries had been designated and the aspects of priority programmes to be developed had been determined, the Commission would seek the support and assistance of private and public international organisations concerned with promoting scientific research to ensure the success of these programmes and to grant them priority financing.

This would constitute the nucleus or basis for the future oceanographic research centre in each country and each subregion, which would gradually grow in proportion to national capacity and the amount of international scientific co-operation.

The Commission should first select the principal centres for international co-operation and the scientific research centres in the developed countries which would carry out ocean programmes and at the same time select scientific research centres in the developing countries capable of carrying out marine scientific research programmes.

Second course of action: Scientific research projects would be encouraged in priority areas identified by the Commission, at developed country research centres, wherever possible with the participation of third-world scientists and with a view to meeting needs identified by the Preparatory Commission, the Authority and the Enterprise in the near future and in the long term.

The above-mentioned courses of action would fulfil three main purposes:

(a) They would help the Authority and the Enterprise by advancing research that could be applied to the requirements of ocean management.

(b) They would contribute to the training of scientists and technicians for the Enterprise and for various sectors in the country where the centre is located in the region.

(c) They would benefit the countries where the centres are located by creating the necessary surroundings and methodology to generate and apply knowledge which other institutions could then adopt, and to establish much-needed centres of excellence in the developing countries which could gradually induce those changes of attitude towards production, resource management, productivity, efficiency etc., without which development is not possible.

Environmental impact study

The Club of Rome studies and apocalyptic predictions on environmental impact startled the world in the 1970s and encouraged political leaders and scientists to seek ways of minimizing changes in the planet's ecosystems caused by human activity. Gradually a new attitude was created in the relationship between man and nature, aimed at preventing alterations in the various ecological systems and thus ensuring that natural wealth could be used for the well-being of society without damaging or destroying this great heritage, to which present and especially future generations have a right.

It must be borne in mind that many changes induced in ecosystems are irreversible and therefore represent an irreparable and unacceptable diminution of the natural world.

All underwater mining activities should guarantee the preservation of the oceans under optimum conditions. The Sui Generis Model Entity should establish the group of technical experts (para. 6, annex, LOS/PCN/L.41/Rev.1) to design models for the management of environmental impact generated by activities in the Area, ready for the entry into force of the Convention.

The Preparatory Commission would request governmental and non-governmental international institutions to provide strong support in three ways.

First: These institutions would submit directly to the Commission studies relating to the marine environment, conservation, preservation, pollution, etc., emphasizing aspects related to the exploration and exploitation of minerals and/or hydrocarbons. This information should be forwarded to the Commission's documentation centre in Jamaica.

Second: They could assist in assigning scientists and specialists who, together with Commission personnel, the group of technical experts and Secretariat personnel, would form specialized working groups in the various fields to analyse information submitted, on the basis of which these groups would draw up master documents on the prevention of pollution and the preservation of the marine environment which the Authority could use when initiating the exploration of the various mine sites.

Third: Lastly, the Commission could encourage country delegations to engage in work which would enable such studies on the marine environment to be completed without delay.

Pioneer site for the Sui Generis Model Entity

In accordance with article 8 of annex III to the Convention, an applicant must submit, after due study, an area the co-ordinates of which permit its division into parts of equal commercial value, together with relevant information relating to mapping, sampling, the abundance of nodules and their metal content, etc.

The Preparatory Commission (Resolution II, para. 3 (a) and (b)), through its team of technical experts (LOS/PCN.41), will designate the part of the area "which is to be reserved in accordance with the Convention for the conduct of activities ... by the Authority through the Enterprise or in association with developing States". The same group of technical experts will study the areas reserved as a result of the registration of pioneer investors and will designate the area it considers to be most suitable for the commencement of pioneer activities.

In the light of information received from the pioneer investors concerning this area, the group of technical experts will design the additional activities required to facilitate the start of the exploration phase as soon as the International Enterprise has been constituted.

The Sui Generis Model Entity would accept this design and proceed with these activities together with these activities together with the Preparatory Commission and the pioneer investors (Resolution II (b) (i) (a) and (b), and (ii)).

Relevant studies and administrative, technical and economic designs for the organization of the Enterprise

The Sui Generis Model Entity would have a temporary administration consisting of the following:

- A Governing Board of eight members, four representing the pioneer investors and four appointed by the Preparatory Commission. The Board would meet in the same place and at the usual times of meetings of the Preparatory Commission and its functions would be to:

  (a) Determine its own organization;

  (b) Appoint a General Co-ordinator;

  (c) Define the policies and programmes to be implemented.

The function of the General Co-ordinator would be to execute the policies and programmes approved and recommended by the Governing Board.

- A technical board, which would be composed essentially of the group of technical experts of the Commission; it would advise the Governing Board and, on behalf of the Preparatory Commission, would support and evaluate the activities of the Model Entity and design the plan of work for the Enterprise.

/...

This fourth option appears to be the one which offers the greatest benefits at least cost, in addition to being the only one which offers the Preparatory Commission and the developing countries the opportunity of participating actively in research and development.

V. THE INTERNATIONAL ENTERPRISE - NUCLEUS ENTERPRISE

With the organization of the Sui Generis Model Entity, the activities envisaged in resolution II carried out by the Preparatory Commission, including the plan of work for the Enterprise, would be completed; thus the technical and administrative foundations would be in place for the Enterprise to initiate its work as soon as the Convention enters into force. Under the established rules, the Enterprise must not be tied down or obligated by activities prior to its being legally constituted; therefore, for the formulation of this second stage, we make three assumptions:

(a) That the Enterprise decides to organize a joint venture to carry out its mining activities at the pioneer site;

(b) That the results obtained in the previous stage by the Sui Generis Model Entity have been successful;

(c) That the pioneer investors present the most favourable conditions for continued association with the Enterprise.

The second phase, which in any case would continue the work initiated by the Preparatory Commission, mainly with regard to training, research and development, as well as environmental management, and which would also be fully developed by the mining Enterprise at all its stages, from exploration to the marketing of minerals, would be organized as a joint venture with two partners, the Enterprise and the pioneer investors, as follows:

The Enterprise and the group of pioneer investors (France, India, Japan and the Union of Soviet Socialist Republics),

Whereas:

One: The United Nations Convention on the Law of the Sea has entered into force;

Two: Activities in the Area for the development of the mineral resources, which constitute the common heritage of mankind, should be initiated as soon as possible;

Three: Several years ago the pioneer investors reached an Understanding which embodied:

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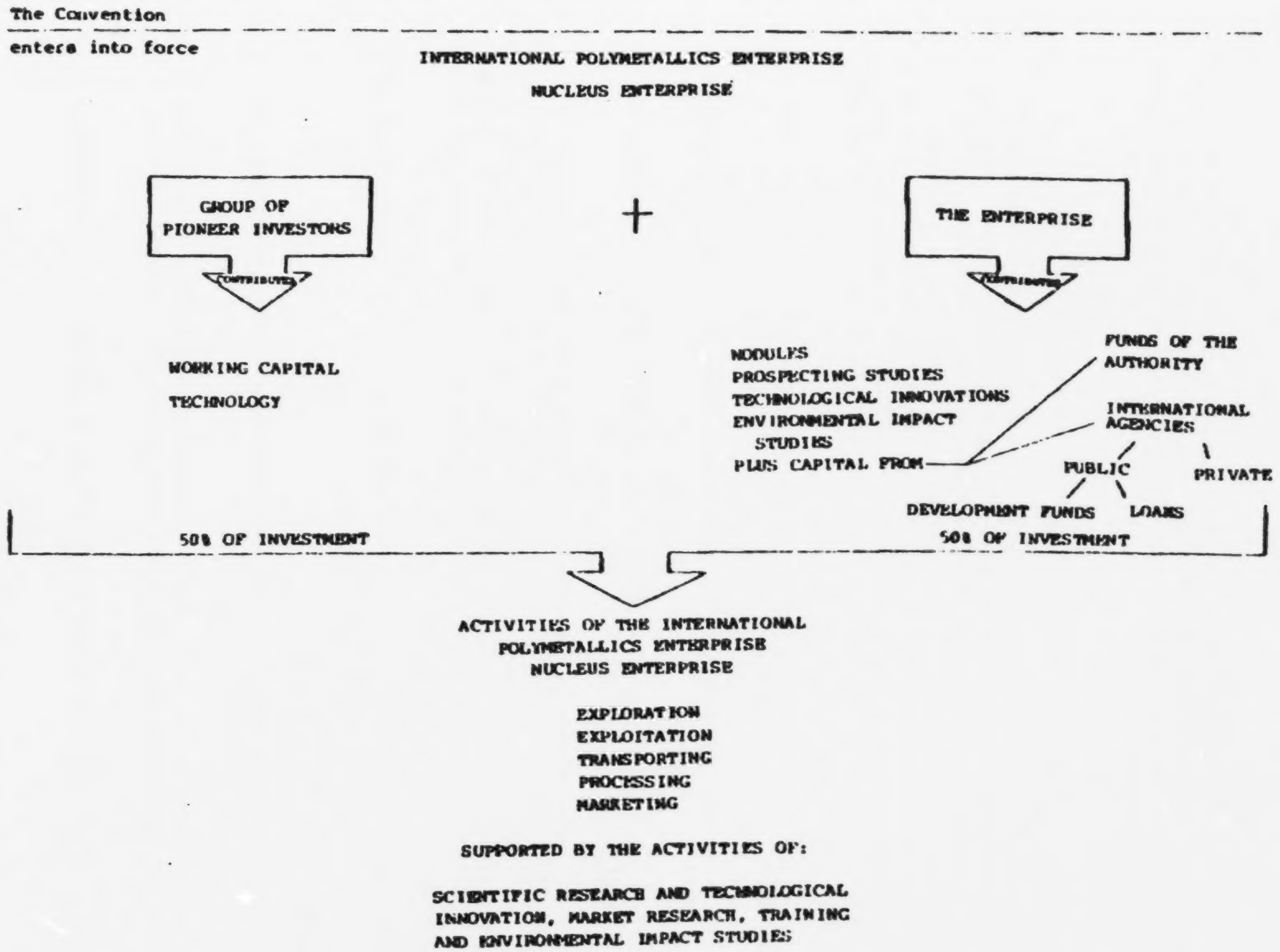
The Convention
enters into force
INTERNATIONAL POLYMETALLICS ENTERPRISE
NUCLEUS ENTERPRISE
GROUP OF PIONEER INVESTORS
CONTRIBUTES
WORKING CAPITAL
TECHNOLOGY
+
THE ENTERPRISE
CONTRIBUTES
NODULES
PROSPECTING STUDIES
TECHNOLOGICAL INNOVATIONS
ENVIRONMENTAL IMPACT STUDIES
PLUS CAPITAL FROM
FUNDS OF THE AUTHORITY
INTERNATIONAL AGENCIES
PUBLIC
PRIVATE
DEVELOPMENT FUNDS
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50% OF INVESTMENT
50% OF INVESTMENT
ACTIVITIES OF THE INTERNATIONAL POLYMETALLICS ENTERPRISE NUCLEUS ENTERPRISE
EXPLORATION
EXPLOITATION
TRANSPORTING
PROCESSING
MARKETING
SUPPORTED BY THE ACTIVITIES OF:
SCIENTIFIC RESEARCH AND TECHNOLOGICAL INNOVATION, MARKET RESEARCH, TRAINING AND ENVIRONMENTAL IMPACT STUDIES

FIGURE 5a

/...

(a) The spirit of friendship and harmony amongst themselves and between them and all the peoples of the planet;

(b) The promise of each of them to work co-operatively;

(c) Their willingness to help in starting operations in the Area as soon as possible;

(d) Their disinterestedness and generosity in making available their knowledge and experience to promote agreement on overlapping areas;

(e) The desire to reach conclusions without distinction as to belief, race, language, etc.;

(f) The accommodation of the different criteria of market and planned economies.

Four: The pioneer investors are now the most economically and technologically solvent entrepreneurs among the members of the Authority and the Enterprise;

Five: The pioneer investors are therefore the members of the world community most suited to carrying out mining operations in the Area;

Six: The pioneer investors and the Preparatory Commission have been working together successfully at the first mine site in the area reserved for the Authority during the period prior to the entry into force of the Convention,

Have agreed as follows:

To conclude an arrangement to form a joint venture to be known as the International Enterprise-Nucleus Enterprise to promote exploration, exploitation, transporting, processing, marketing, environmental impact studies and research and development at the first mine site in one of the areas reserved for the Enterprise, in full compliance with annex III, article 11, and other documents.

The Enterprise would be characterized by strong emphasis on the development of scientific research and of technological innovation in marine areas as an essential factor in promoting progress in underwater mining and enhancing knowledge about the environment, as a means to ensure harmony between human work and the balance of oceanic processes; these factors could generate technological alternatives which, when properly adapted and put to use, would promote the progress and welfare of the developing countries.

The work would begin at the first mine site which the Preparatory Commission, through the expert group, had selected for the exploration operations of the Sui Generis Model Entity; this work, as noted above, should preferably not be interrupted. The Enterprise could also further other work at the sites chosen by the Commission at the time when the pioneer investors were registered, in

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accordance with the plan of work referred to in article 153, paragraph 3, and in annex III, article 11, already prepared during the Preparatory Commission stage.

The International Enterprise would divide its operations into three parts:

The first, composed of prospecting, exploration and exploitation activities, would be executed in the Area, at the site selected, and would be based on the work done by the Model Entity.

The second would involve transporting and processing activities, which would be promoted through negotiations between the International Enterprise and other enterprises or countries.

The third would be devoted to marketing, an activity which had started during the period of the Sui Generis Model Entity of the Preparatory Commission as market research, and which would now become fully operational. The International Enterprise would make detailed studies of supply and demand, production and consumption, and a market analysis for each metal produced by land-based producers.

The various activities of the Enterprise would be carried out "step by step": with the initiation of the first (exploration) stage, experimentation would simultaneously begin for the second (exploitation) stage, with activities such as personnel training and testing needed for actual exploitation activities until the required knowledge, experience and mastery were attained (see figure).

After the second (exploitation) stage had begun, the experimentation activities preparatory to the third stage would be initiated, and so on until the final (marketing) stage was reached.

The principal office of the International Enterprise would be located in Jamaica, the seat of the Authority; other offices related to specific activities, such as transport, and especially processing plants, would be located in the places judged most suitable in accordance with the technical and economic surveys and negotiations with enterprises, agencies and countries. The same procedure would be used for marketing offices, which could be located in both industrialized and developing countries.

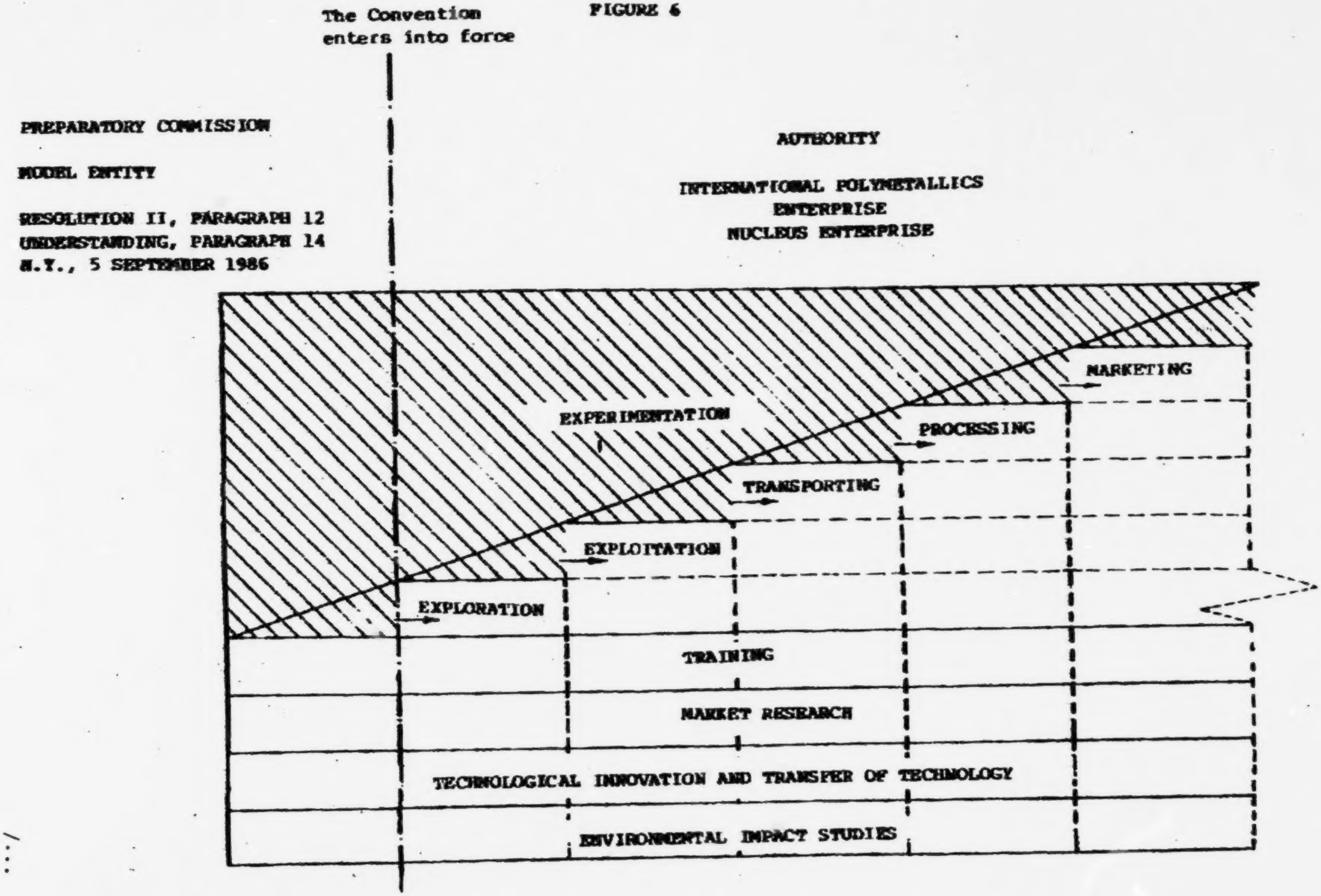
Half the capital of the International Enterprise would be contributed by the pioneer investors, and half by the Enterprise.

The pioneer investors would contribute technology and working capital; the amounts would be calculated in United States dollars.

The Enterprise would contribute nodules from the reserved area, found in the area of the pioneer mining operation on the basis of the prospecting studies carried out during the Preparatory Commission stage on the abundance of nodules, their concentration, possible quantity, geological and topographical characteristics of the sea-bed and technological innovations, if any, during the

PLAN OF ACTIVITIES OF THE
INTERNATIONAL POLYMETALLICS ENTERPRISE
NUCLEUS ENTERPRISE

FIGURE 6


The Convention
enters into force
PREPARATORY COMMISSION
MODEL ENTITY
RESOLUTION II, PARAGRAPH 12
UNDERSTANDING, PARAGRAPH 14
N.Y., 5 SEPTEMBER 1986
AUTHORITY
INTERNATIONAL POLYMETALLICS
ENTERPRISE
NUCLEUS ENTERPRISE
EXPERIMENTATION
MARKETING
PROCESSING
TRANSPORTING
EXPLOITATION
EXPLORATION
TRAINING
MARKET RESEARCH
TECHNOLOGICAL INNOVATION AND TRANSFER OF TECHNOLOGY
ENVIRONMENTAL IMPACT STUDIES

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Preparatory Commission stage. The Enterprise would also provide trained personnel in management, engineering, the technological and scientific field and administration. In addition, it would furnish environmental impact studies and other relevant surveys conducted by the groups organized by the Preparatory Commission.

Working capital contributed by the Enterprise would be made up of funds from the Authority taken from its own revenues, funds from the international public sector such as the World Bank, the United Nations Development Programme, the European Economic Community, etc., and non-governmental organizations interested in promoting marine scientific research, technological innovation and the preservation and conservation of the marine environment.

The Authority would negotiate with the industrialized countries to convince them to allocate part of their international technical co-operation funds to marine development programmes, through the International Enterprise and the regional research and development centres.

The International Enterprise would have a Governing Council composed of nine members, four of whom would be appointed by the group of pioneer investors, and five of whom would be appointed by the Authority.

The Governing Council would have the following functions:

(a) To determine its own organization;

(b) To appoint the President of the Enterprise;

(c) To establish statutes fully in compliance with the Convention, the Authority and the Enterprise;

(d) To define the policies of the International Enterprise;

(e) To adopt any plans and programmes to be submitted by the President.

The President of the International Enterprise would be the senior executive of the Enterprise and would have, inter alia, the following functions:

(a) To be the legal representative of the entity;

(b) To report directly to the Governing Council;

(c) To be responsible for the execution of all the Enterprise's activities;

(d) To submit to the Governing Council any plans and programmes to be carried out by the entity.

Constituted in the above-mentioned form, the International Enterprise would be in a highly favourable position, since it would receive scientific and technological inputs from four technological models, one for each of the pioneer investors. The selection, integration and use of these technologies and the continued advances made by the pioneer investors would call for a strong commitment of the intelligence and experience of the expert group (LOS/PCN/SCN.2/WP.7, para. 4), and other Authority experts to achieve the best results in supplying appropriate technology for the development of the Enterprise.

The scientific, technological, procedural and financing criteria for each of the activities of exploration, exploitation, transporting, processing and marketing have been fully and carefully discussed in the first, second and third JEFERAD documents (LOS/PCN/SCN.2/L.2, Add.1 and Rev.1), the Australian document (LOS/PCN/SCN.2/WP.10) and the document submitted by the delegation of the Federal Republic of Germany (LOS/PCN/SCN.2/WP.5), which refer to the current conditions of markets and technologies.

By the time the Convention enters into force, these conditions, particularly with regard to technological advances, will necessarily have changed, and the criteria will therefore have to be changed or adjusted accordingly.

To this end, the Authority will provide a nucleus of highly trained and specialized personnel to develop the designs and plans best suited to these conditions.

The delegation of Colombia, having thus completed the work assigned to it in New York during the August-September 1986 session, wishes to express its appreciation to the International Ocean Institute (IOI), of Halifax, Canada, for its valuable co-operation, particularly that of its outstanding director, Elizabeth Mann Borgese, who is a widely supported and internationally respected representative to the United Nations; to the International Development Research Center (IDRC) of Canada and its director for Latin America, Fernando Chaparro; to the Colombian "Francisco José de Caldas" Fund for Scientific Research and Special Projects (Colciencias), and its directors Pedro Amaya and Jorge Ahomada, as well as to Jaime Ayala, Director of the Second Botanical Expedition Foundation; to the companies Ecopetrol, Carbocol, the Colombian Oceanography Commission, Econíquel, Cerromatoso, Ingeominas, Flota Mercante Grancolombiana and Telecom, whose technological support we appreciate; and to the National Army and its Ports and Maritime Office - without whose co-operation it would been impossible to complete the work - with the advice, support and encouragement of the Ministry of Foreign Affairs, Undersecretariat for International Organizations, headed by Clemencia Forero Ucrós and Fernando Alzate. The drafting and co-ordination group takes note of the efforts made in such a short period of time and, in submitting this study for the consideration of the countries members of the Preparatory Commission for the International Sea-Bed Authority and for the International Tribunal for the Law of the Sea, it expresses thanks in advance and appreciation

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for any ideas and proposals formulated in general debate which will broaden and strengthen this proposal, the purpose of which is to reconcile fairly the interests of the industrialized countries with those of countries still seeking greater development, thereby bringing into balance the economic aspirations of the international community for a better standard of living.

The technical drafting committee was composed of Minister Alfonso López Reina, an international expert appointed by the United Nations; Gustavo Guerrero Ph.D., adviser; and Ambassador Antonio José Uribe Portocarrero, general co-ordinator.

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LOS/PCN/SCN.2/WP.14/Add.2
18 May 1988

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2

THE INTERNATIONAL VENTURE

(Study submitted by the Republic of Colombia)

Addendum

I. THE ENTERPRISE: TODAY AND TOMORROW

1. With the registration of the first four pioneer investors, Law of the Sea developments and the work of the Preparatory Commission have entered a new phase. An interim régime for ocean mining is now in place, with the operational responsibilities of the Preparatory Commission clearly defined in paragraph 12 of resolution II: the exploration of the first mine site for the Enterprise; and the availability of technology and trained manpower to the Enterprise, enabling it to keep pace with developments in the most advanced countries.

2. As the Preparatory Commission was about to enter this new phase, the pioneer investors already announced that they would fulfil their responsibilities and make joint arrangements for the exploration of the mine site as well as for the development of human resources which would have to be associated with the exploration of the mine site and, implicitly - although this has not yet been stated explicitly by the pioneers - with the testing and upgrading of the technology employed for the exploration of the mine site.

3. To determine the mechanisms and modalities for these arrangements will have to be a priority task of the Preparatory Commission during its next sessions. For this purpose, the Preparatory Commission may avail itself of much work already accomplished. In particular, reference should be made to the Secretariat papers and to the Austrian and Colombian working papers.

4. It is the thesis of the present paper that the shape of these arrangements will have a determining influence on the shape of the initial or "nucleus"

Enterprise upon the coming into force of the Convention; and that, in turn, the Preparatory Commission's concept of the future Enterprise will have an influence on the shape of the interim arrangements. In conclusion, some immediate next steps will be suggested.

II. CONCEPT OF THE ENTERPRISE

5. Some of the features of the Enterprise, though perhaps not the most important, or the most operational ones, are clearly determined by the Convention.

(a) The Enterprise shall be the organ of the Authority which shall carry out activities in the Area directly, and this will include "activities in the area" (exploration, mining) as well as transporting, processing and marketing of minerals recovered from the Area;

(b) For these purposes, the Enterprise must be provided with initial financing as well as technology. The Authority and States parties shall co-operate in these undertakings. Obviously, there are many ways in which this can be done. With regard to the financing, the Preparatory Commission will have to determine the amount of needed funding and the criteria and factors for its adjustment (annex IV, art. 11, para. 3 (a)). With regard to technology transfer, the Convention spells out some modalities in article 5 of annex III, but the Convention also foresees other ways, e.g., in conjunction with joint ventures between the Enterprise and States or companies, and in this case, modalities are left wide open, to be determined by the joint venture agreements from case to case (annex III, art. 5, para. (6));

(c) The Enterprise shall have legal personality and such legal capacity as needed for the exercise of its functions and the fulfilment of its purposes;

(d) The Enterprise will be governed by a Governing Board of 15 highly qualified members, elected by the Assembly upon the recommendation of the Council. The Board will elect its own Chairman;

(e) The Enterprise will be administered by a Director-General, also elected by the Assembly upon recommendation by the Council. The Director-General shall be responsible for the organization, management, appointment and dismissal of the staff of the Enterprise. The size, the nature, the functions of the staff are left wide open.

6. There is consensus in the Preparatory Commission as to what the Enterprise shall not be:

(a) It shall not be an international bureaucracy organized and financed for functions which it cannot exercise, owing to economic conditions prevailing today and in the foreseeable future;

(b) Although it shall operate "on sound commercial principles", it cannot be organized like an entity, e.g., a mining company, which, as demonstrated so strikingly in the Australian working paper, would be incapable of developing the requisite technologies.

7. Discussions on what the Enterprise shall be have barely begun. It should not be difficult to reach consensus on the principle that the Enterprise must be based on the experience of the most advanced systems of international high-technology management.

8. The Colombian working paper drew attention to the EUREKA/EUROMAR structure as an example of an advanced system of high-technology management where the private and the public sector co-operate effectively on the international level.

9. The function of the Enterprise, during its first phase upon the coming into force of the Convention, would be - as also suggested by the Austrian and Colombian working papers - deep sea-bed exploration and research on, and development of, technologies for exploration, mining and processing deep sea-bed minerals through joint arrangements between sea-bed mining States and companies who would participate with 50 per cent of venture capital and existing technology, and developing countries, whose participation would be financed by public international funding institutions such as the World Bank, the United Nations Development Programme, the European Investment Bank, etc., or national development co-operation institutions such as the Canadian International Development Agency (CIDA), the International Development Research Centre (Canada) (IDRC), the Swedish International Development Authority (SIDA), the Norwegian Agency for International Development (NORAD), etc.

10. The Enterprise would have all the attributes enumerated in paragraph 5 above. In addition, it would have:

(a) Information gathering and conferencing facilities where groups of outstanding scientists and technicians from all parts of the world could meet periodically to keep the Enterprise up-to-date on the state of the art of sea-bed mining technology and lay the foundation for a data base;

(b) Its own research and development facilities where scientists and technicians from the industrialized countries would work together with scientists and technicians from developing countries in upgrading existing technologies and developing new mining concepts: participation in the research and development being the most cost/effective and productive form of "training";

(c) Its own training programmes, in high-technology management, the interactions between all high technologies and ocean mining technologies; the interactions between nodule mining technologies and the technologies required for the mining of other resources available on the deep sea-bed (crusts, sulphides), etc.

11. It may be premature to speculate on the size of the initial core staff and budget of the Enterprise as this will be determined by the stage of work reached by the Preparatory Commission at the moment of the coming into force of the Convention and the establishment of the Enterprise (see below). This budget may range

anywhere between $150,000 per annum and half a million dollars, or it could be $5 million a year, as indicated in the Colombian working paper.

12. The three functions mentioned in paragraph 10 above should be embodied in separate modules financed independently:

(a) Conferencing and information gathering activities should be carried out in co-operation with the Fridjof Nansen Institute;

(b) Research and development activities should be financed on the basis of approved and viable projects, jointly by industrial companies and their Governments and international or national fnding agencies (see para. 9 above);

(c) Training activities should be carried out in co-operation with and financed by institutions such as the International Ocean Institute.

13. This concept of the Enterprise would also contribute to redefine, within the terms of the Convention and in the light of present realities, the initial functions of the Authority as a whole. The Authority, and, in particular, the Council, would play the role that the Conference of Ministers plays in the EUREKA/EUROMAR system, i.e., it would examine research and development projects pre-selected by national co-ordinators; it would make the final selection; it would make arrangements for funding; and it would allocate projects to national research and development institutes, universities, departments of industrial companies, associated high-technology institutes, or to the Enterprise itself. In other words, just like the regional centres for research and development in marine industrial technology, the Authority would act as a catalyst; it would arrange for the networking of various institutes through appropriate work allocation; it would act as a promoter and co-ordinator of technology development and exploration projects; and, through the Enterprise, it would also act as a developer of technology.

14. Undoubtedly there had been initial difficulties in getting the EUREKA concept off the ground in Europe. But today there can be no doubt that it has been a tremendous boon to high-technology development in Europe for which it has been able to mobilize billions of dollars. A similar boon can be anticipated for ocean-mining technology under an analogous system to which the structure of the Authority and the Enterprise can readily be adopted, fully within the terms of the Convention. The only difference between the two systems is that, in the ocean mining system, public international funding is to be used, from the very outset, to finance the participation of developing countries. This may eventually occur also in EUREKA, and especially in EUROMAR, perhaps through the establishment of regional centres, but for the Authority/Enterprise system, it is a fundamental principle, benefiting developing countries, industrialized countries, and the international institution at the same time.

15. The essence of this concept of the Authority and the Enterprise is that it cannot be conceived in the traditional sense as an intergovernmental organization: a financial burden on member States which they must bear to keep the organization alive. Nor can it be conceived as a business which, according to "sound commercial principles", must yield an adequate return on investment. Nor is there any

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possibility of making a transition from one to the other. The concept of a non-productive "nucleus Enterprise" constituting a burden on States, which then should transform itself into a profitable business, is an erroneous concept that cannot work in practice.

16. The Enterprise and the Authority must be conceived as productive and financially beneficient to all parties concerned from the outset, and it must be built in such a way that subsequent stages can be integrated without a break in the fundamental structure. The Enterprise and the Authority must, from the outset, be conceived as a new form of scientific/industrial co-operation between North and South, beneficial to both.

III. INFLUENCE OF THIS CONCEPT ON PRESENT ARRANGEMENTS

17. Such a concept of the Enterprise and the Authority would be beneficial for the present work of the Preparatory Commission both conceptually and operationally.

18. Conceptually, it allows a somewhat broader definition of "sound commercial principles" to which the activities of the Enterprise are to conform (annex IV, art. 1, para. (3)). For there can be no doubt that EUREKA is being operated in accordance with "sound commercial principles", even though these are not defined in terms of short-range financial returns on investment. EUREKA is based on the recognition that (a) the development of high technology is crucial for industrial development and competitiveness; and (b) such development requires co-operation, and sharing of high risks and high costs, between the private and the public sector at the international scale. Otherwise high-technology development remains the monopoly of super-Powers who can finance it out of their State or military budgets. These are sound commercial principles. They apply to sea-bed mining technologies which belong to the family of high technologies, and they are the principles on which this concept of the Enterprise and the Authority is based.

19. Operationally, this concept of the future shape and function of the Authority and the Enterprise should guide the Preparatory Commission's course of action in implementing paragraph 12 of resolution II so that it might lead directly and smoothly to the establishment of the kind of institution envisaged upon the coming into force of the Convention.

IV. INFLUENCE OF PRESENT ARRANGEMENTS ON THE SHAPE OF THE INITIAL OR "NUCLEUS" ENTERPRISE

20. It is assumed now that the four pioneer investors proceed as they have announced with the implementation of paragraph 12 of resolution II: they make joint arrangements for the exploration of the first mine site for the Enterprise. Such arrangements, obviously, can take a great variety of forms, and the pioneer investors will negotiate the one that will appear most beneficial to all parties concerned. It is assumed, for illustrative purposes only, that they will elaborate a plan of work for the next three years, providing for about three months of ship time and nine months of laboratory time per year. The cost - again, for illustrative purposes only - is projected at $20 million.

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21. This includes provision of a research vessel which will be selected from one of the four countries. The contribution for the ship, at $10,000 per day (exclusive of the cost of the international crew) is budgeted as $2,700,000.

22. It also includes the selection of exploration technology and its "transfer", at fair commercial prices, to the joint undertaking. The terms of this "transfer" can be freely negotiated among the pioneer investors. During the exploration, this technology will be tested and projects will be formulated for its upgrading at the laboratory.

23. A typical plan of work for the next three years, based on "sound commercial principles", will include testing of mining and processing technology as well as transport logistics and market surveys and studies on the interaction between other technologies, e.g., materials technology, synthetics, and recycling, and economic studies on the interactions between land-based and ocean mining.

24. The pioneers have announced that their responsibility for the training of personnel from developing countries for the Enterprise will be undertaken jointly, and in conjunction with the exploration of the mine site for the Enterprise. The most cost/effective and "organic" way of providing such training would be to select a small number - probably around 15 - highly qualified scientists, technicians, managers and economists from developing countries on a competitive basis, and let them participate in these testing, upgrading and study activities. The cost for this would be very modest, especially if shared among the four pioneer investors, on their common research ship or in their separate but well co-ordinated laboratories; and the result would be beneficial not only to the "trainees" and their countries, but to the joint venture itself as these "trainees" would contribute actively to the implementation of the plan of work.

25. It is assumed that it will take about a year to make arrangements for this joint undertaking and formulate a plan of work. This plan of work, obviously, has nothing to do with the kind of plans of work to be submitted by contractors and approved by the Council upon the coming into force of the Convention. It is a plan of work formulated by the pioneer investors to facilitate implementation of paragraph 12 of resolution II; it is sui generis, and the pioneers are free to give it whatever form they think most suitable.

26. The work could be completed at the end of 1991, at which time, approximately, the Convention might come into force. The following elements will now be in place:

(a) A mine site, fully explored;

(b) A management system, including a complete crew capable of performing all the functions of exploration, technology, research and development, planning and projecting;

(c) State-of-the-art technology, which was used and developed during the exploration of the mine site for the Enterprise;

(d) An information network based on the experience of years of co-operation and mutual training.

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27. All that has to be done, at this point, is to complete the institutional framework as prescribed by the Convention and outlined in paragraph 5 above. This Enterprise will be entirely functional; it will not be a "nucleus"; it will not be interim; it will not have to wait for changes in the market: it will generate such changes; it will fulfil its tasks like any other scientific/industrial project, be it EUREKA or EUROMAR.

V. IMMEDIATE NEXT STEPS

28. Within this broad concept, and strictly within the terms of the Convention and of resolution II, the following immediate next steps could be envisaged:

(a) Overall implementation of paragraph 12 of resolution II:

The Preparatory Commission and the first group of pioneer investors should elaborate a memorandum of understanding on the modalities of the exploration of the first mine site for the Enterprise, the testing and upgrading of technology and the training of manpower in this connection. This should be based on a plan of work for these interrelated activities for the next three years;

(b) Training:

(i) Invitations should be issued to all members of the Preparatory Commission to nominate candidates for training. Each State should nominate two candidates;

(ii) A Commission should be appointed to organize a system of examinations for the final selection of candidates, in co-operation with the pioneer investors. This could be a special sub-commission of the General Committee, or the Advisory Committee on Training of the Second Special Commission should be given this mandate;

(c) Transfer of technology:

The mandate of the Committee of Experts should be expanded to include the following:

(i) Gathering of information on the state-of-the-art of sea-bed-mining-related technologies, and preparation of an annual report to the Under-Secretary-General;

(ii) Co-ordinating efforts to bring developing countries as partners into international undertakings in research and development in sea-bed-mining-related technologies and to assist in making arrangements for the financing of such participation.

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LOS/PCN/SCN.2/WP.15
25 February 1988

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEA-BED AUTHORITY
AND FOR THE INTERNATIONAL TRIBUNAL
FOR THE LAW OF THE SEA
Special Commission 2
Sixth session
Kingston, Jamaica
14 March-8 April 1988

STRUCTURE AND ORGANIZATION OF THE ENTERPRISE

Working paper by the Secretariat

1. At the 1987 New York session, Special Commission 2 decided to take up for consideration at the sixth session, time permitting, matters relating to the organization and structure of the Enterprise. (See Statement of the Chairman, LOS/PCN/L.50, paragraph 10 (b).) The Secretariat was requested to prepare a background paper in order that the deliberations on these matters can be facilitated. General administrative, financial and personnel matters were to be brought within the ambit of the Secretariat paper, bearing in mind also the interrelationships involved with the operational options available to the Enterprise. The Secretariat was also asked to review available materials and identify possible precedents for administrative, financial and personnel management within such a commercial entity as the Enterprise. By a circular letter of 24 November 1987, pursuant to paragraph 10 (b) of the Chairman's report, delegations were called upon to submit either directly to the Secretariat or to the Special Commission relevant information and views specifically on the question of appropriate precedents.

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Aspects previously considered

2. Discussions of Special Commission 2, relevant to the question of the structure and organization of the Enterprise, have so far dealt with one aspect only -- start-up conditions and requirements -- and with the understanding that the operational choice the Enterprise finally adopts will affect many of its features, including its internal organization and management. Operational options available to the Enterprise and alternative approaches to technology acquisition have been discussed in earlier working papers along with the associated manpower requirements (documents LOS/PCN/SCN.2/WP.2 and 6). Moreover, in those recent discussions the Special Commission considered these matters only with reference to a situation where the Enterprise may come into existence at a time when it would not be feasible to proceed directly with project planning and implementation. The approach of beginning with an initial "nucleus Enterprise" was consequently formulated in that context and is discussed in document LOS/PCN/SCN.2/WP.12. It will also be useful to recall the earlier suggestions made in document LOS/PCN/SCN.2/WP.7 regarding the use of special experts to facilitate preparations and planning for the Enterprise in the pre-operational era. These various suggestions may be summarized in diagrammatic form, as rendered in figure 1 below. The individual experts involved at any one stage throughout the sequence would not necessarily be the same persons. Also, it may be preferable to only use the expression "nucleus Enterprise" to describe the initial structure following election of the Governing Board and Director-General. At that stage also, the Enterprise personnel and the Director-General may continue to be located within the Authority with administrative expenses included with those of the Authority. Financial autonomy would be achieved essentially only in connection with operational decisions.

3. This particular aspect of the question of structure and organization of the Enterprise is recalled in the present paper in view of its importance in illustrating the need to regard organizational development as an evolutionary and learning process. A continuing focus on the initial or nucleus arrangement will thus be advisable under any economic projection and any recommendations as to preferred organizational modes.

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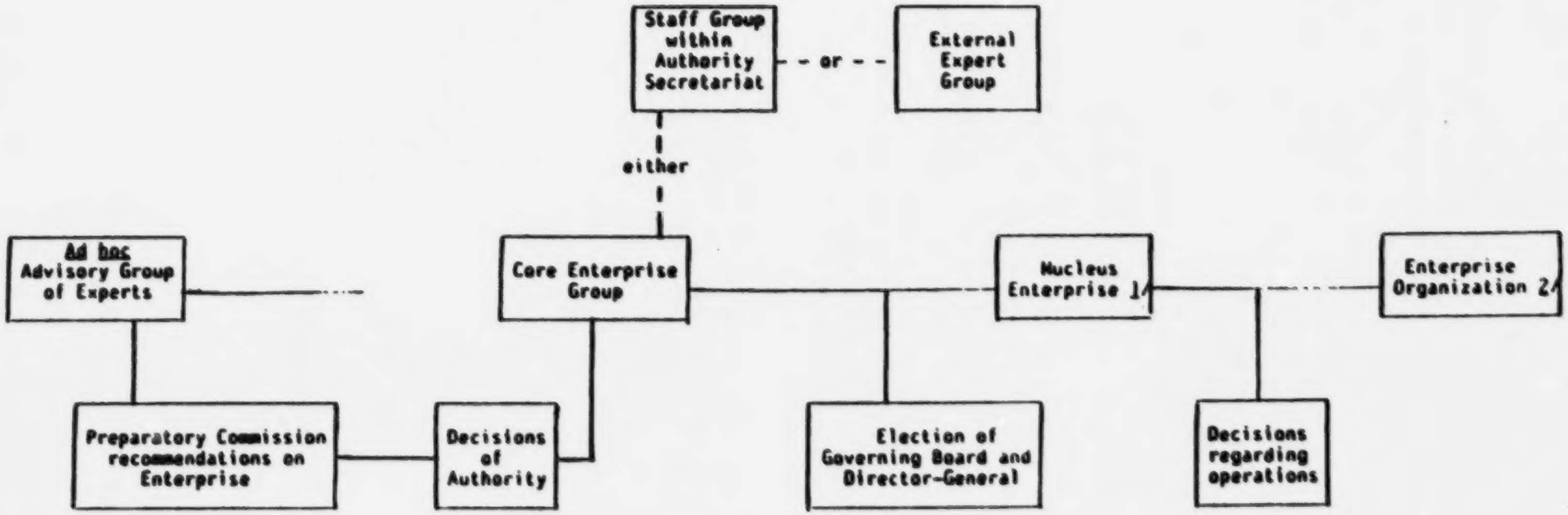
Figure 1. Flow chart of possible organizational decisions leading to the operational Enterprise


Staff Group
within
Authority
Secretariat
or
External
Expert
Group
either
Ad hoc
Advisory Group
of Experts
Core Enterprise
Group
Nucleus
Enterprise 1/
Enterprise
Organization 2/
Preparatory Commission
recommendations on
Enterprise
Decisions
of
Authority
Election of
Governing Board and
Director-General
Decisions
regarding
operations

1/ For detail, see figure 2, page 13.

2/ For detail, see figure 3, page 14.

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Scope of this paper

4. There are a number of important elements which will affect both the general recommendations to be made by the Special Commission on the structure and organization of the Enterprise and the form they will finally take as a consequence of decisions that can only be made by the Enterprise itself. Foremost amongst them is the need for the Enterprise to be continuously in harmony with its external environment, including that of the industry to which it belongs. Such general considerations are first examined before taking up more detailed organizational questions. This paper thus presents:

I. General considerations;

II. Major requirements;

III. Alternative structures;

IV. Integrated project management system;

V. Financial management;

VI. Contracting policy;

VII. Personnel policies;

VIII. Concluding remarks.

5. For the preparation of this paper, the Secretariat has noted the several views communicated to it by delegations in response to the above-mentioned letter: elaboration of administrative, financial and personnel management policies and procedures should be left to the Director-General of the Enterprise, since these will be influenced by Enterprise activities and those of comparable entities; any preliminary work on these matters should preferably be done at a later stage and by a core group of experts, if one is established to advise on questions concerning the start-up of the Enterprise; there appear to be no sufficiently appropriate precedents given the unique character and functions of the Enterprise and it would not be justified therefore to collect, analyse and evaluate diverse information (normal commercial practices would however be expected to apply).

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I. GENERAL CONSIDERATIONS

6. The Enterprise will be a major component of a large interlocking system encompassing the directing organs of the Authority and all the industrial entities involved. Its basic structure, consistent with that system, has already been decided upon. There will be a Governing Board of 15 persons; a Director-General (elected by the Assembly on the recommendation of the Council); and an international staff 1/. The Governing Board is the ultimate authority within this predetermined internal structure, so that the combined capabilities and experience of its members will be very important to the success of the Enterprise as will the capabilities and experience of the Director-General and the working relationship between the two. The Enterprise is, in the main, an autonomous entity, but it will come under the general control and guidance of the Assembly and Council. Moreover, the Council will exercise specific controls, particularly on budgetary and financial matters and on work plans 2/. This particular hierarchical aspect of the decision-making involved will need to be kept in mind. At the same time the relationship between the Enterprise and the Council may be viewed as an important avenue by which the Enterprise achieves harmony with its general political and economic environment and with the deep sea-bed mining industry itself.

7. The Enterprise will be an internationally-owned and operated entity in a resource-based industry. It will moreover be an entirely new entity, and not the result of an amalgamation or evolution of pre-existing elements. There is thus no true precedent for the Enterprise. One of the existing international organizations with operational functions is INMARSAT. It is however involved in a service, not a resource-based industry, and is owned and operated by designated national authorities of States Parties to the agreement concerned. On the other hand, international organizations established under commodity agreements and working in resource-based industries essentially perform monitoring, negotiating and administrative functions and cannot be considered operational in the sense of the Enterprise. It should be noted that the multinational entities presently involved in the sea-bed mining industry are typically conglomerates of a number of pre-existing companies whose activities are co-ordinated and integrated by a central-directing committee. In terms of structure and organization they are nonetheless at an early stage of development, their activities for the meantime being essentially limited to research and development of technology. Their evolution — and also that of the State enterprises — may yield the most useful information for the organizational structure, policies and strategies of the Enterprise and for the functional relationships within the organization itself. Its Governing Board and Director-General can therefore be expected to follow closely the organizational aspects of the development of the other entities in the industry.

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8. The Enterprise, as has been discussed in an earlier paper 3/, would have to operate in an uncertain environment both as regards technology and market conditions. The capability to configure an ocean mining system, or other systems of similar complexity, will be important. But decisions regarding choice of technology, operational mode, capital structure and human resource development strategy await a set of economically favourable and enabling conditions, so that a dynamic policy flux will exist for some time. One of the ways of reducing this uncertainty would be very careful monitoring and analysis of the development of deepsea mining technology and the behaviour of metal markets and prices. The development of methods of technology assessment, technology forecasting, price forecasting etc. would obviously be aids in this regard. Such activities, it may be noted, would have a more general use, by no means limited to the needs of the Enterprise alone.

9. Information on the external environment will in any event be essential for efficient policy and programme formulation. The long-range planning of the Enterprise will have to be preceded by forecasts of such factors as the future of metal markets, the likely advances in deep sea mining and associated technologies, the likely future availability of skilled manpower, and the likely availability of capital from financial markets. Planning would also have to give consideration to the industry system.

10. The Enterprise will be dealing with large-scale capital investments (in the order of US$2.0-$2.5 billion for a single sea-bed mining project) so that the mobilization of such resources and their optimal utilization become crucial tasks. Clearly its management must evaluate projects very carefully as well as the associated risks. Given the difficulties of mobilizing equity capital, the Enterprise will have to establish strategies minimizing capital requirements, e.g. through the use of supplier's credit, consumer's credit, equipment-leasing schemes. The use of sensitivity analysis as well as probabilistic techniques, methods of decision analysis, etc. can all be used in this regard, 4/ but it has to be kept in mind that however sophisticated these tools may be, large areas of uncertainty and risk will remain. During the past two decades, management processes and procedures have been recognized as the most crucial of an organization's assets since only capable management can assure maximum utilization of resources. Without capable management, capital can be frittered away, expensive technology can lie idle and human resources allowed to go to seed. Equally seriously, without capable managers in sufficient numbers, many emerging opportunities can be lost. 5/ The organizational climate has, therefore, to encourage the development of managerial skills in harmony with a reasonably high orientation towards risk and uncertainty. Errors and failures in such a context should be expected to result from experimentation and should serve as a source of institutional learning. This has implications for both personnel policy and general management procedures.

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11. The Enterprise must have a well conceived human resources development system, in tune with the constantly changing nature of its technological and economic environment. The system will need to be based on (i) a selection process whereby individuals are matched to the job descriptions; (ii) experience-planning whereby individuals may be moved through a series of jobs; and (iii) creation of training and educational opportunities.

12. The modern organization is a system of interdependent parts encompassing individuals and informal work groupings as well as formal structures, where the emphasis is on the performance of the organization as an integrated whole. 6/ The degree of interaction between the different parts determines the ability to reach multi-disciplinary solutions to complex problems and thereby mitigate the impact of problems arising from specialization of functions.

13. The Enterprise moreover will be operating in a future characterized by transience, complexity, professionalism and the growth of technocracy, which will call for organizational changes in the interests of sheer survival. 7/ Such changes will typically involve further re-organization of authority structures and work processes, broadening of the span of control, eliminating or redefining positions, altering work flows, and greater automation as well as closer communications among organization members and groupings. 8/ The perspectives by which such changes will be brought about relate to a combination of operations research, organization and methods analysis, management and organization development.

14. There are several European organizations in the realm of advanced technology areas like aircraft, space and electronic systems that have been set up with the intention of accelerating technology innovation and development by sharing expenses, resources and markets. While their objective is limited, relative to that of the Enterprise, some organizational aspects are of interest. A study of these organizations, 9/ including, inter alia, the Concorde, SYMPHONIE (satellite communications), ESRO (European Space Research Organization) and ELDO (European Launcher Development Organization), examined such problems as those that result from differences of structure and custom as among the governments involved, and stressed the need for strong leadership, mutual trust and esprit de corps within the organization, for well designed technology strategies and for management procedures capable of integrating numerous diverse elements into advanced systems. That study further emphasized the importance of giving the chief executive wide latitude on personnel matters. The study concludes by stressing that leadership can only exercise effective strategy within an adequate and appropriate structure; conversely the structure should be such as to allow the leader to change it in order to complement institutional goals and policy formulation and implementation.

II. MAJOR REQUIREMENTS

15. Organization design is thus interrelated with a number of other variables: effective management of the organization's technical and economic environment; effective interorganizational linkages; development of human resources; efficient management of sophisticated and complex technologies; the ability to plan and effectively implement programmes; and optimal financial management capability.

16. In designing the Enterprise's organizational structure, many perspectives would be necessary:

(i) the technological, to ensure that the organizational structure is capable of dynamically adapting itself to the changing technical scene;

(ii) the political, so that the Enterprise can effectively interface with the Authority, the Council and States parties;

(iii) the commercial, including financial and economic, so that the capability of working in an economical and cost-effective manner is developed;

(iv) the legal, since the legal environment, including the rules, regulations and procedures could affect organization structure in significant ways;

(v) the managerial, so that programmes can be comprehensively planned, operations appropriately monitored, and interorganizational linkages established;

(vi) that of organizational learning so that the structure is viewed as a self-regulating mechanism whereby the use of evaluation as a feed-back mechanism to keep the organization dynamically in phase with the environment as well as internally consistent and harmonious.

17. Structure, as is apparent, has to be viewed as much more than an objective set of relationships and formal location of authority (as in an organization chart). In reality, the structure has to be viewed as an evolving process. The emphasis must be on a performance-oriented organization and, since the evolving structure has also to be cost-effective, it would seem necessary for the Enterprise to keep its staff requirements as low as possible consistent with the objectives and tasks it has to achieve.

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18. The organizational structure also needs to have well developed co-ordinating mechanisms, and a system of sharing information. The communication network has to be so established that not only does it function as a stimulus to action but also as a control and co-ordination mechanism linking the decision centres in the system into a synchronized pattern. 10/ Hence the organization should have a strong capability in management information systems (MIS) including a data bank on developments in ocean technology. The MIS should be on a holistic and integrated basis for such a comprehensive information system is invaluable for strategic planning and the development of complementary programmes. While the final information processing system may be determined only on the basis of the operational decision, it would seem desirable to introduce computerization and electronic data processing systems from the very initial stages so that later dislocations are avoided.

III. ALTERNATIVE STRUCTURES

19. There are essentially two alternative approaches: the large integrated corporate structure where the Enterprise takes care of all of its own affairs and conducts all operations 11/; and the corporate "head office" which establishes secondary or subsidiary structures as a consequence of management's decisions on operations. It would be more difficult to plan for an integrated corporation with full in-house capabilities as an evolving structure. Moreover, in today's market conditions there would be a tendency under this approach to raise administrative expenses beyond acceptable levels. The only variants within this approach would stem from the extent to which the Enterprise could be expected to rely on in-house professional expertise. Decisions on human resource development, e.g. training of counterpart staff through service agreements, would not have a direct impact on corporate structure.

20. There are numerous variants under the second approach of the corporate "head office". For example, a decision to proceed through subcontracting would mean the establishment of an operating arm for funding and project management. Under a joint venture decision, the head office might establish a subsidiary which would be the joint venture partner, the Enterprise proper becoming a virtual holding company. In fact, the variants under this second approach can be arranged in a descending scale of operational involvement on the part of the head office which would at all times however carry the financial responsibility. The least level of involvement would be where subsidiary corporate structures are set up to carry out different phases of operations, e.g. separate mining and processing subsidiaries. The Enterprise head office, under such an approach, need only be a relatively small organization — both in the early and in the later stages.

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IV. INTEGRATED PROJECT MANAGEMENT SYSTEM

21. Enterprise projects will involve large-scale capital investments, sophisticated technology and a long gestation period. The projects would also entail co-ordination of the work of a large number of consultants, contractors, vendors and agencies. Given the very complex sequence of events involved, it will be necessary to have an integrated project management system for:

(a) co-ordinating the efforts of all project participants;

(b) identifying the inter-relationships between tasks and responsibility;

(c) developing realistic time schedules;

(d) optimizing use of resources;

(e) planning, scheduling, monitoring, reporting, reviewing and controlling.

22. The integrated project management system itself is linked to the overall financial management system so that costs, timing and value of the large capital-investment projects are controlled. More recently, powerful techniques of control have been developed — management information systems, financial management techniques, on-line monitoring, etc. These methods, although evolved in piecemeal fashion over the years, actually form a single interlocking system. Application of these techniques within a dynamic overall-system concept, aided by electronic data processing systems, can firmly guide the most complex projects towards minimum cost, on-time completion, and profitable operation. These techniques generally relate to:

(i) capital cost — estimating and controlling the money invested,

(ii) time — planning, scheduling and monitoring for smooth progress toward early completion,

(iii) value — predetermining and controlling income as related to investment, operating costs and risks. 12/

23. To make these techniques effective, there must be appropriate procedures for estimating and controlling each project stage — research and development, exploration, engineering design, procurement and construction, initial operation, and commercial operations. The three groups of project control techniques — capital cost, time, and value — and their associated procedures are interlinked and interrelated with the organization structure. In a dynamically advancing organization these techniques have to be appropriately located and established and brought in harmony with the sequence of activities.

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V. FINANCIAL MANAGEMENT

24. A number of financial matters like accountability to the Council/Assembly, audit, borrowing power, presentation and approval of budget, submission of financial statements, apportioning of funds etc. are already provided for in the Convention. 13/ There are well developed practices for the financial management of projects and existing commercial practices with respect to accounting, management of working capital, budgetary control, etc. can be easily applied. Elaboration or refinement of these practices and procedures to meet any special needs of the Enterprise would be carried out at the appropriate time by its management.

VI. CONTRACTING POLICY

25. Particularly under the second structural alternative (see paragraphs 19 and 20 above), the establishment of a contracting policy assumes special importance. A contracting policy would also be required under the full corporate structure, given the likely reliance on arrangements with external organizations in support of education and training, R & D and even on operational aspects such as marketing. The aim of any contracting policy is to ensure that contracts fully match the particular circumstances of each project or requirement. Contract work can be performed under several different types of contracts, 14/ the most common being:

(a) Cost plus contracts. This kind of contract would require the Enterprise to pay all expenses (staff, materials, housing, etc.) plus a guaranteed return on the money invested. It is typical in R & D activity and for developing high-technology. While it provides a great degree of flexibility, there is a lack of incentive to keep expenses down;

(b) Cost-plus contracts with guaranteed maximums. This is a variant of the cost-plus contract whereby the contractor has to pay out of his own pocket if the cost exceeds a certain maximum. Its advantage is that the ceiling is fixed, and if the job is finished cheaply the savings go to the Enterprise;

(c) Incentive contracts. This type of contract provides a benefit or penalty according to the time of job completion and the actual as opposed to tendered price. It has been used successfully for drilling contracts in difficult salt-dome formations;

(d) Lump-sum contracts. This is the usual type, based on complete specifications and drawings. Through competitive bidding a reasonable price is ensured and the quality of work has to be checked through inspections;

(e) Unit-price contracts. These are used in cases where the quality and type of work can be clearly defined but the quantity is in doubt, e.g., the number of collectors required in a deep-sea mining project.

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VII. PERSONNEL POLICIES

26. Personnel policies must be integrated with all other aspects of the organization. Since neither the operational mode nor the interrelated structure can yet be chosen, it is only possible to consider those aspects of personnel policy which are common to all or most of the structures. Recruitment and selection processes, salaries, working conditions, methods of dealing with staff redundancy and their redeployment etc. are not covered since there are very well established systems for handling these matters. These can be easily grafted later on. Training is also not dealt with here as it has been extensively covered in earlier documents. 15/

27. The organization has to manage innovation. This would require co-ordination of research activities, given the interdependency of high-tech research and integration of this activity into the larger process of organizational management. 16/ Moreover, all members of the organization would have to be prepared to combine with others in serving the general aims of the Enterprise, thus ruling out rigid functional areas and attitudes that lead to self-contained roles in favour of multi-disciplinary team work. 17/ The ability to work in teams or groups of associates will be highly important, as will recognition of the role of external experts. 18/ The inculcation of these attitudes thus becomes part of the management development strategy.

28. Personnel policy would have to enhance opportunities for learning on the job, as well as provide training and educational opportunities. The concept of "temporary" staff on deputation for short periods from R & D centres, design engineering organizations etc. would also have to be considered as one way of ensuring that advanced skills are always available to the Enterprise. Reverse deputation of Enterprise personnel to such organizations could be another device for keeping staff up to date. Short term contracts, rather than permanent positions, would be another way of keeping the organization up-to-date by hiring required skills from the market as and when required.

VIII. CONCLUDING REMARKS

29. The structure, organization and administration of the Enterprise have to be seen in the contexts of a dynamic and evolving environment, a rapidly advancing high-technology and large-scale capital investments. Structures must reflect the need for an evolving organization which is flexible, cost-effective, performance-oriented and capable of tackling uncertainty. The administrative procedures, financial management system and personnel policies must be such as to keep pace with the broader processes of change and adaptation. A "nucleus Enterprise" of high-grade professionals working under some very broad-band policies and procedures will be the necessary first step towards a fully fledged organisation which can through time develop into a commercially competitive and technologically up-to-date system. Figures 2 and 3 below illustrate how such an evolution might be expressed in structural terms as from a nucleus to a mature organization about to enter upon commercial operations.

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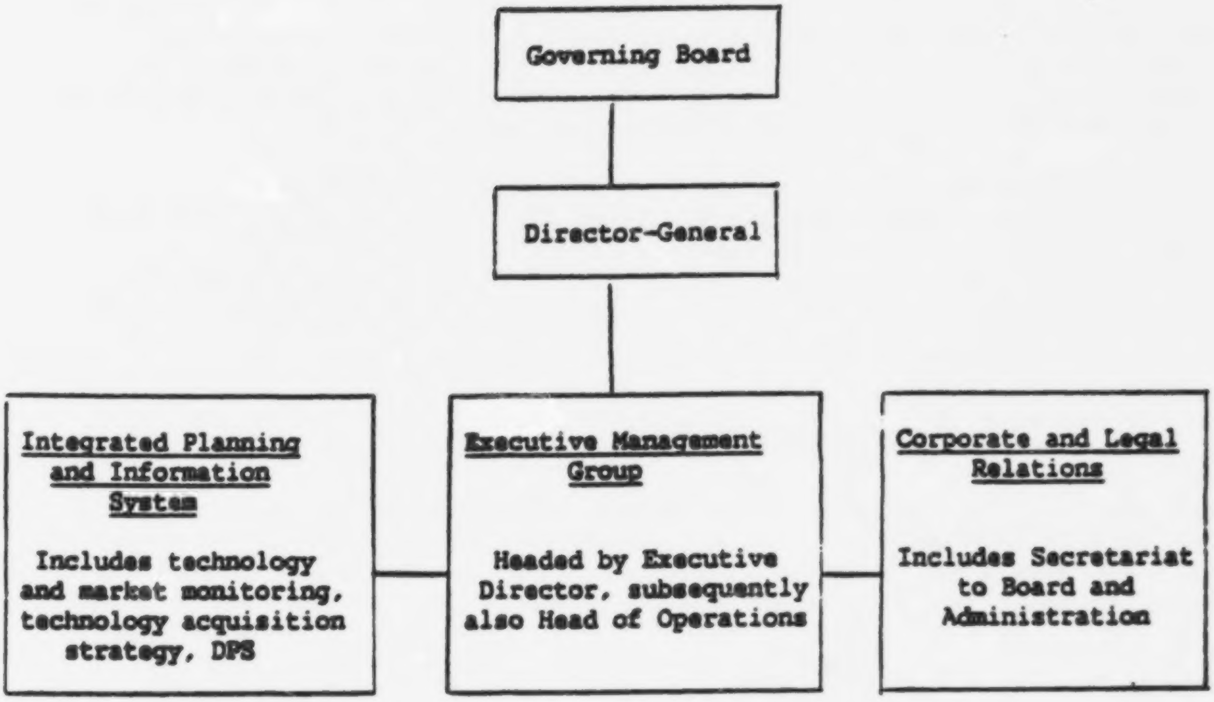
Figure 2. The Nucleus Enterprise *


Governing Board
Director-General
Integrated Planning and Information System
Includes technology and market monitoring, technology acquisition strategy, DPS
Executive Management Group
Headed by Executive Director, subsequently also Head of Operations
Corporate and Legal Relations
Includes Secretariat to Board and Administration

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* See also figure 1, page 3.

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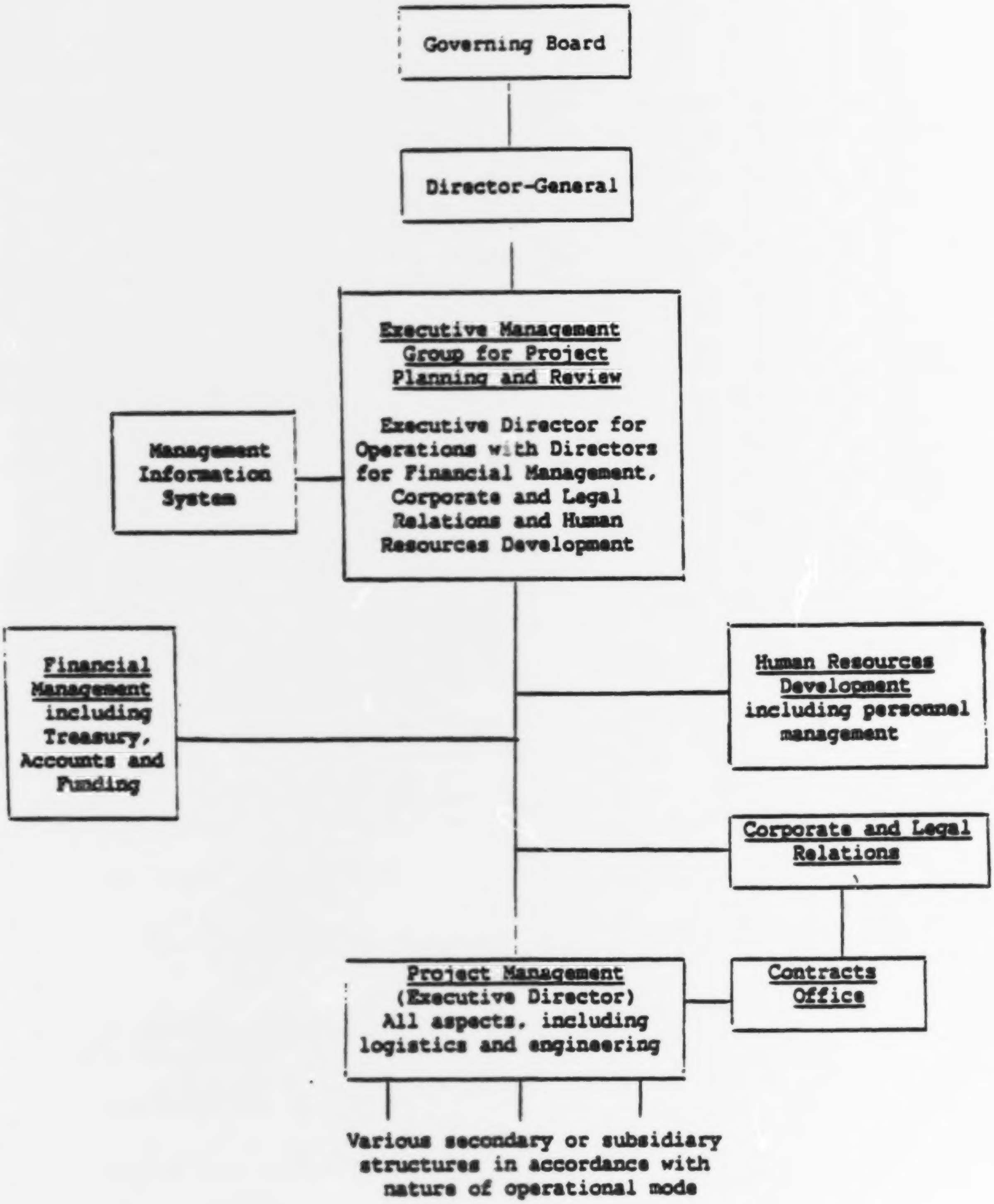
Figure 3. Enterprise Organization (Head Office) *


Governing Board
Director-General
Executive Management Group for Project Planning and Review
Executive Director for Operations with Directors for Financial Management, Corporate and Legal Relations and Human Resources Development
Management Information System
Financial Management including Treasury, Accounts and Funding
Human Resources Development including personnel management
Corporate and Legal Relations
Project Management (Executive Director) All aspects, including logistics and engineering
Contracts Office
Various secondary or subsidiary structures in accordance with nature of operational mode

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* See also figure 1, page 3.

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LOS/PCN/SCN.2/WP.16
22 February 1989

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SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2
Kingston, 27 February-23 March 1989

PROVISIONS OF THE CONVENTION RELATING TO THE STRUCTURE AND ORGANIZATION OF THE ENTERPRISE

(Working paper by the Secretariat)

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INTRODUCTION

1. The present paper has been prepared pursuant to the request of Special Commission 2 at the last session (see LOS/PCN/L.60, para. 17) and bearing in mind the most recent conclusions of the Special Commission on the subject of the structure and organization of the Enterprise (see LOS/PCN/L.60, paras. 13-16).

2. An important part of the mandate of Special Commission 2 is the preparation of recommendations on the structure and organization of the Enterprise pursuant to the relevant provisions set forth in the Convention. Given the emphasis in its mandate on facilitating the establishment and "early entry into effective operation of the Enterprise", the Special Commission has concentrated on initial requirements and has already concluded that it must formulate a special recommendation which would address the decisions to be made at the first meeting of the Authority relating to the Enterprise.

3. The present paper thus follows upon earlier discussions and papers (see LOS/PCN/SC.2/WP.13 and 15) which focused primarily on the question of establishing a "nucleus Enterprise" designed to meet a possible situation where the Convention has entered into force before the commercial viability of sea-bed mining has been established or reliably projected. An arrangement would be needed in that case to provide for the monitoring of all factors affecting the development of policies and plans for the Enterprise and for the continuance of pre-feasibility work, particularly on operational options. However, there has been no agreement on the precise form and status of such an initial "nucleus" since there are obvious uncertainties as to the prevailing situation at the time of entry into force of the Convention, uncertainties which presumably will have an effect not only upon questions of the structure and organization of the Enterprise, but also more generally. The options discussed in the Special Commission have ranged from the creation of a special Enterprise unit within the secretariat of the Authority to an embryonic institution having a certain degree of responsibility and accountability.

4. At the same time, discussions on the question of proceeding from a "nucleus" to a "final" Enterprise (i.e., from an arrangement for the conduct of preparatory, pre-operational activities through subsequent stages to a fully operational mining entity) have recognized that the structure and organization of the Enterprise will need to be allowed to evolve according to the institutional goals and policies it establishes for itself. These in turn, it is understood, will reflect its assessment of prevailing conditions and the progress made in formulating operational policies and strategies.

5. Whatever the forms envisaged for the Enterprise in its initial and early stages, a "nucleus Enterprise" must serve as a logical first step in an evolutionary process and must be a derivation or distillation of the entity contemplated in the Convention. It will thus be important to begin with a clear picture of the basic norms set forth in the Convention. The present paper has therefore taken the various provisions relating to the Enterprise, which are dispersed throughout Part XI of the Convention and its annexes, and brought them together for this purpose. On the matter of their relevancy to a "nucleus

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Enterprise", particular attention is drawn to those rules which concern the nature and purpose of the Enterprise; its relationship to the rest of the Authority; its general structure and financial basis; and its legal personality. It may be noted that some additional rules have been included on matters such as confidentiality, since these aspects would need to be taken into account at the early, pre-operational stages of the evolution of the Enterprise. On the other hand, certain of the rules which have been included in the present paper in order to give a complete and coherent picture of the Enterprise, would not necessarily be relevant to requirements at those early stages.

PROVISIONS OF THE CONVENTION RELATING TO THE STRUCTURE AND ORGANIZATION OF THE ENTERPRISE

Article 1

Use of terms

For the purposes of these articles:

(1) "Area" means the sea-bed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction;

(2) "Authority" means the International Sea-Bed Authority;

(3) "activities in the Area" means all activities of exploration for, and exploitation of, the resources of the Area;

(4) "Convention" means the United Nations Convention on the Law of the Sea;

(5) "Secretary-General" means the Secretary-General of the Authority;

(6) "debt guarantee" means a promise of a State Party to creditors of the Enterprise to pay, pro rata in accordance with the appropriate scale, the financial obligations of the Enterprise covered by the guarantee following notice by the creditors to the State Party of a default by the Enterprise. Procedures for the payment of those obligations shall be in conformity with the rules, regulations and procedures of the Authority; 1/

(7) "States Parties" has the same meaning as in article 1, paragraph 2, of the Convention;

(8) "Director-General" means the Director-General of the Enterprise.

Section 1. ESTABLISHMENT OF THE ENTERPRISE

Article 2

Establishment

There is hereby established the Enterprise, the organ through which the Authority shall carry out the functions referred to in article 170, paragraph 1, of the Convention. 2/

1/ Annex IV, article 11 (3) (h).

2/ Article 158 (2).

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Section 2. PURPOSES OF THE ENTERPRISE

Article 3

Purposes of the Enterprise

1. The Enterprise shall be the organ of the Authority which shall carry out activities in the Area directly, pursuant to article 153, paragraph 2 (a), of the Convention, as well as the transporting, processing and marketing of minerals recovered from the Area. 3/

2. In carrying out its purposes and its functions, the Enterprise shall not interfere in the political affairs of any State Party, nor shall it be influenced in its decisions by the political character of the State Party concerned. 4/

3. Only commercial considerations shall be relevant to its decisions, and these considerations shall be weighed impartially in order to carry out the purposes specified in paragraph 1. 5/

Section 3. LEGAL PERSONALITY

Article 4

Legal personality

1. The Enterprise shall, within the framework of the international legal personality of the Authority, have such legal capacity as is necessary for the exercise of its functions and the fulfilment of its purposes as is provided for in the Statute set forth in Annex IV and, in particular, the capacity: 6/

(a) to enter into contracts, joint arrangements or other arrangements, including agreements with States and international organisations;

(b) to acquire, lease, hold and dispose of immovable and movable property;

(c) to be a party to legal proceedings; 7/

3/ Article 170 (1).

4/ Annex IV, article 12 (7).

5/ Annex IV, article 12 (7).

6/ Article 170 (2); Annex IV, article 13 (2).

7/ Annex IV, article 13.

/...

(d) to loan money, issue guarantees and use its credit;

(e) to acquire, hold, use and dispose of shares or other interests in, or obligations of, corporations, associations, partnerships, trusts or other enterprises, or any obligations of a Government;

(f) to pay pension and establish pension plans, profit sharing and other incentive plans for its staff;

(g) to indemnify the members of the Governing Board, the Director-General, officials and staff; and

(h) to exercise such powers incidental to its business as shall be necessary. 8/

2. The Enterprise shall act in accordance with the Convention and the rules, regulations and procedures of the Authority, as well as the general policies established by the Assembly, and shall be subject to the directives and control of the Council. 9/

3. Subject to paragraph 2, the Enterprise shall enjoy autonomy in the conduct of its operations. 10/

Section 4. PLACE OF BUSINESS

Article 5

Place of business

1. The Enterprise shall have its principal office at the seat of the Authority. 11/

2. The Governing Board may establish in the territory of any State Party with the consent of that State Party other offices and facilities as it deems necessary for the exercise of the functions of the Enterprise. 12/

8/ Annex IV, article 12 (6).

9/ Article 170 (2).

10/ Annex IV, article 2 (2).

11/ Annex IV, article 8.

12/ Annex IV, article 8.

Section 5. STRUCTURE OF THE ENTERPRISE

Article 6

Structure

The Enterprise shall have a Governing Board, a Director-General and the staff necessary for the exercise of its functions. [13]

Section 6. THE GOVERNING BOARD

Article 7

Convening of first meeting

The first meeting of the Governing Board shall be convened by the Secretary-General within [...] following the date on which the Convention enters into force.

Article 8

Frequency of meetings

The Governing Board shall meet as often as the business of the Enterprise may require. [14]

Article 9

Place of meeting

The Governing Board shall normally function at the principal office of the Enterprise. [15]

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[13] Annex IV, article 4.

[14] Annex IV, article 5 (6).

[15] Annex IV, article 5 (6).

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Article 10

Membership

1. The Governing Board shall be composed of 15 members elected in accordance with article 24, subparagraph (b). 16/

2. Members of the Board shall act in their personal capacity. In the performance of their duties they shall not seek or receive instructions from any Government or from any other source. 17/

Article 11

Equitable geographical distribution and the representation of special interests

In the election of members of the Governing Board, due account shall be taken of the need for equitable geographical distribution and the representation of special interests. 18/

Article 12

Nominations

In submitting nominations of candidates for election to the Governing Board, members of the Authority shall bear in mind the need to nominate candidates of the highest standard of competence, with qualifications in relevant fields, so as to ensure the viability and success of the Enterprise. 19/

Article 13

Term of office

1. Members of the Governing Board shall be elected for four years and may be re-elected; and due regard shall be paid to the principle of rotation of membership. 20/

16/ Annex IV, article 5 (1).

17/ Annex IV, article 5 (4).

18/ Based upon article 163 (4).

19/ Annex IV, article 5 (1).

20/ Annex IV, article 5 (2).

2. Members of the Board shall continue in office until their successors are elected. 21/

3. If the office of a member of the Board becomes vacant, the Assembly shall, in accordance with article 24, subparagraph (b), elect a new member for the remainder of his predecessor's term. 22/

Article 14

Remuneration

Each member of the Governing Board shall receive remuneration to be paid out of the funds of the Enterprise. The amount of remuneration shall be fixed by the Assembly, upon the recommendation of the Council. 23/

Article 15

Powers and functions of the Governing Board

1. The Governing Board shall direct the operations of the Enterprise. Subject to the Convention, the Board shall exercise the powers necessary to fulfil the purposes of the Enterprise, including powers: 24/

(a) to elect a Chairman from among its members;

(b) to adopt its rules of procedure;

(c) to draw up and submit formal written plans of work to the Council in accordance with article 153, paragraph 3, and article 162, paragraph 2 (j), of the Convention;

(d) to develop plans of work and programmes for carrying out the activities specified in article 170 of the Convention;

(e) to prepare and submit to the Council applications for production authorizations in accordance with article 151, paragraphs 2 to 7, of the Convention;

21/ Annex IV, article 5 (3).

22/ Annex IV, article 5 (3).

23/ Annex IV, article 5 (5).

24/ Annex IV, article 6.

/...

(f) to authorise negotiations concerning the acquisition of technology, including those provided for in Annex III, article 5, paragraph 3 (a), (c) and (d), of the Convention, and to approve the results of those negotiations;

(g) to establish terms and conditions, and to authorise negotiations, concerning joint ventures and other forms of joint arrangements referred to in Annex III, articles 9 and 11, of the Convention, and to approve the results of such negotiations;

(h) to recommend to the Assembly what portion of the net income of the Enterprise should be retained as its reserves in accordance with article 160, paragraph 2 (f), and Annex IV, article 10, of the Convention;

(i) to approve the annual budget of the Enterprise;

(j) to authorise the procurement of goods and services in accordance with Annex IV, article 12, paragraph 3, of the Convention;

(k) to submit an annual report to the Council in accordance with Annex IV, article 9, of the Convention;

(l) to submit to the Council for the approval of the Assembly draft rules in respect of the organisation, management, appointment and dismissal of the staff of the Enterprise and to adopt regulations to give effect to such rules;

(m) to borrow funds and to furnish such collateral or other security as it may determine in accordance with Annex IV, article 11, paragraph 2, of the Convention;

(n) to enter into any legal proceedings, agreements and transactions and to take any other actions in accordance with Annex IV, article 13, of the Convention;

(o) to delegate, subject to the approval of the Council, any non-discretionary powers to the Director-General and to its committees;

(p) to nominate the Director-General for recommendation by the Council and election by the Assembly; 25/

(q) to recommend to the Council the ceiling on the Enterprise's borrowings; 26/

25/ Annex IV, article 7 (1).

26/ Annex IV, article 11 (2) (a).

/...

(r) to prepare, at the earliest practicable date after the Convention enters into force, and thereafter at annual or other appropriate intervals, a schedule of the magnitude and timing of its requirements for the funding of its administrative expenses and for activities carried out by the Enterprise in accordance with article 170 and Annex IV, article 12, of the Convention; 27/

(s) to prepare a funding schedule for the repayment of the interest-free loans to the Enterprise from States Parties to be adopted by the Assembly upon the recommendation of the Council. 28/

2. In addition, the Governing Board shall:

(a) establish procurement rules, regulations and procedures in accordance with article 43; 29/

(b) establish reporting requirements and procedures pursuant to Annex IV, article 9, of the Convention;

(c) set out procedures for funding pursuant to Annex IV, article 11, of the Convention;

(d) provide procedures for the approval of the annual budget pursuant to article 15, paragraph 1 (i);

(e) establish accounting and internal audit procedures.

Article 16

Quorum for meetings

Two thirds of the members of the Governing Board shall constitute a quorum. 30/

27/ Annex IV, article 11 (3) (d) (ii).

28/ Annex IV, article 11 (3) (f).

29/ Annex IV, article 12 (3).

30/ Annex IV, article 5 (7).

Article 17

Voting rights

Each member of the Governing Board shall have one vote. 31/

Article 18

Decision-making

1. All matters before the Governing Board shall be decided by a majority of its members. If a member has a conflict of interests on a matter before the Board he shall refrain from voting on that matter. 32/

2. However, before a matter of substance is put to the vote, the Governing Board shall make every effort to reach agreement on such matters by the way of consensus.

3. For the purpose of this article, "consensus" means the absence of any formal objection.

Section 7. THE DIRECTOR-GENERAL AND THE STAFF OF THE ENTERPRISE

Article 19

The Director-General

1. The Director-General shall be elected in accordance with article 24, subparagraph (b).

2. The Director-General shall not be a member of the Governing Board.

3. The Director-General shall hold office for a fixed term, not exceeding five years, and may be re-elected for further terms. 33/

31/ Annex IV, article 5 (8).

32/ Annex IV, article 5 (8).

33/ Annex IV, article 7 (1).

/...

Article 20

Functions and duties of the Director-General

1. The Director-General shall act as the legal representative and chief executive of the Enterprise and shall be directly responsible to the Governing Board for the conduct of the operations of the Enterprise.

2. The Director-General shall be responsible for the organization, management, appointment and dismissal of the staff of the Enterprise in accordance with the rules and regulations referred to in article 15, paragraph 1 (1).

3. The Director-General shall participate, without the right to vote, in the meetings of the Governing Board and may participate, without the right to vote, in the meetings of the Assembly and the Council when these organs are dealing with matters concerning the Enterprise. 34/

Article 21

The staff of the Enterprise

1. The staff of the Enterprise shall be appointed by the Director-General. The terms and conditions on which they shall be appointed, remunerated and dismissed shall be in accordance with the rules and regulations referred to in article 15, paragraph 1 (1). 35/

2. The staff of the Enterprise shall consist of such qualified scientific and technical and other personnel as may be required to fulfil the administrative functions of the Enterprise. 36/

3. The paramount consideration in the recruitment and employment of the staff and in the determination of their conditions of service shall be the necessity of securing the highest standards of efficiency and of technical competence. Subject to this consideration, due regard shall be paid to the importance of recruiting the staff on an equitable geographical basis. 37/

4. The responsibilities set forth in article 168, paragraph 2, of the Convention, are equally applicable to the staff of the Enterprise. 38/

34/ Annex IV, article 7 (2).

35/ Based upon article 167 (3).

36/ Based upon article 167 (1).

37/ Annex IV, article 7 (3).

38/ Annex IV, article 7 (5).

/...

Article 22

International character of the Director-General and the staff

In the performance of their duties the Director-General and the staff shall not seek or receive instructions from any Government or from any other source external to the Enterprise. They shall refrain from any action which might reflect on their position as international officials of the Enterprise responsible only to the Enterprise. Each State Party undertakes to respect the exclusively international character of the responsibilities of the Director-General and the staff and not to seek to influence them in the discharge of their responsibilities. 39/

Section 8. CONFIDENTIALITY

Article 23

Confidentiality

1. The members of the Governing Board and the Director-General and the staff of the Enterprise shall not disclose, even after the termination of their functions as such, any confidential information coming to their knowledge by reason of their duties on or in relation to the Enterprise.

2. The duty of the members of the Governing Board and the Director-General and the staff of the Enterprise not to disclose confidential information constitutes both an obligation in respect of the individual's appointment or employment for the purposes of the Enterprise and a personal responsibility entailing financial liability. In addition to being liable to any financial or other sanction, any person who has disclosed confidential information in breach of his duty in that behalf shall cease to exercise any function in relation to the receipt or custody of confidential information and shall be disqualified from being re-elected or reappointed to exercise any such function. 40/

39/ Annex IV, article 7 (4).

40/ LOS/PCN/WP.24, rule 16.

Section 9. RELATIONSHIP OF THE ENTERPRISE TO THE ASSEMBLY AND TO THE COUNCIL OF THE AUTHORITY

Article 24

The Assembly

The Assembly shall:

(a) establish general policies for the Enterprise pursuant to article 170, paragraph 2, and Annex IV, article 2, paragraph 1, of the Convention;

(b) elect, upon the recommendation of the Council, the members of the Governing Board and the Director-General; 41/

(c) fix, upon the recommendation of the Council, the remuneration of the members of the Governing Board; 42/

(d) determine, upon the recommendation of the Governing Board, what portion of the net income of the Enterprise shall be retained as reserves of the Enterprise; 43/

(e) consider and approve, upon the recommendation of the Governing Board of the Enterprise, the rules, regulations and procedures relating to the transfer of funds from the Enterprise to the Authority; 44/

(f) adopt, upon the recommendation of the Council and the advice of the Governing Board, the schedule to repay interest-free loans from States Parties to the Enterprise; 45/

(g) approve draft rules submitted by the Council in respect of the organisation, management, appointment and dismissal of staff in accordance with article 15, paragraph 1 (1). 46/

41/ Article 160 (2) (c).

42/ Annex IV, article 5 (5).

43/ Annex IV, article 10 (2).

44/ Article 160 (2) (f) (ii).

45/ Annex IV, article 11 (3) (f).

46/ Annex IV, article 6 (1).

/...

Article 25

The Council

The Council shall:

(a) issue directives to the Enterprise in accordance with article 170 of the Convention; 47/

(b) recommend to the Assembly candidates for the election of the members of the Governing Board and the Director-General; 48/

(c) recommend to the Assembly the remuneration of the members of the Governing Board; 49/

(d) approve, upon the recommendation of the Governing Board, the ceiling on borrowings of the Enterprise; 50/

(e) appoint the independent auditor referred to in article 30;

(f) approve the delegation by the Governing Board of any non-discretionary powers to the Director-General and to its committees; 51/

(g) approve plans of work submitted by the Governing Board in accordance with Annex IV, article 12, of the Convention, applying, mutatis mutandis, the procedures set forth in article 162, paragraph 2 (j), of the Convention; 52/

(h) approve applications submitted by the Governing Board for production authorizations; 53/

(i) receive the annual report of the Governing Board; 54/

47/ Article 162 (2) (i).

48/ Article 162 (2) (c).

49/ Annex IV, article 5 (5).

50/ Annex IV, article 11 (2) (a).

51/ Annex IV, article 6 (o).

52/ Article 162 (2) (k).

53/ Annex IV, article 6 (e).

54/ Annex IV, article 6 (k).

/...

(j) consider the reports of the Enterprise and transmit them to the Assembly with its recommendations; 55/

(k) receive from the Governing Board and submit to the Assembly for approval draft rules in respect of the organisation, management, appointment and dismissal of staff; 56/

(l) consider the annual reports containing an audited statement of accounts and receive at appropriate intervals a summary statement of the financial position of the Enterprise and a profit and loss statement showing the results of its operations; 57/

(m) recommend to the Assembly a schedule for the repayment of interest-free loans to the Enterprise from States Parties on the advice of the Governing Board; 58/

(n) approve guidelines with regard to the preferences to be accorded to goods and services originating in developing States, including the land-locked and the geographically disadvantaged among them. 59/

Section 10. FINANCES

Article 26

Sources of funds

The funds of the Enterprise shall include:

(a) amounts received from the Authority in accordance with article 173, paragraph 2 (b), of the Convention;

(b) voluntary contributions made by States Parties for the purpose of financing the activities of the Enterprise;

(c) funds borrowed by the Enterprise;

(d) income of the Enterprise from its operations;

55/ Article 162 (2) (g).

56/ Annex IV, article 6 (1).

57/ Annex IV, article 9 (1).

58/ Annex IV, article 11 (3) (f).

59/ Annex IV, article 12 (3) (b) (ii).

/...

(e) other funds made available to the Enterprise to enable it to commence operations as soon as possible and to carry out its functions. 60/

Article 27

Borrowing power of the Enterprise

1. The Enterprise shall have the power to borrow funds and to furnish such collateral or other security as it may determine. Before making a public sale of its obligations in the financial markets or currency of a State Party, the Enterprise shall obtain the approval of that State Party. The total amount of borrowings shall be approved by the Council upon the recommendation of the Governing Board.

2. States Parties shall make every reasonable effort to support applications by the Enterprise for loans on capital markets and from international financial institutions. 61/

Article 28

Financing of the first mine site and initial administrative expenses

1. The Enterprise shall be provided with the funds necessary to explore and exploit one mine site and to transport, process and market the minerals recovered therefrom and the nickel, copper, cobalt and manganese obtained, and to meet its initial administrative expenses. 62/

2. All States Parties shall make available to the Enterprise an amount equivalent to one half of the funds referred to in paragraph 1 by the way of long-term interest-free loans in accordance with the scale of assessments for the United Nations regular budget in force at the time when the assessments were made, adjusted to take into account the States which are not members of the United Nations. Debt incurred by the Enterprise in raising the other half of the funds shall be guaranteed by all States Parties in accordance with the same scale.

3. If the sum of the financial contributions of States Parties is less than the funds to be provided to the Enterprise under paragraph 1, the Assembly shall, at

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60/ Annex IV, article 11 (1) (e).

61/ Annex IV, article 11 (2).

62/ The Preparatory Commission should note that the amount of the said funds, and the criteria and factors for its adjustment, shall be included in the draft rules, regulations and procedures of the Authority.

its first session, consider the extent of the shortfall and adopt by consensus measures for dealing with this shortfall, taking into account the obligations of States Parties under paragraphs 1 and 2, and any recommendations of the Preparatory Commission.

4. (a) Each State Party shall, within 60 days after the entry into force of the Convention, or within 30 days after the deposit of its instruments of ratification or accession, whichever is later, deposit with the Enterprise irrevocable, non-negotiable, non-interest-bearing promissory notes in the amount of the share of such State Party of interest-free loans pursuant to paragraph 2.

(b) The Governing Board shall prepare, at the earliest practicable date after the Convention enters into force, and thereafter at annual or other appropriate intervals, a schedule of the magnitude and timing of its requirements for the funding of its administrative expenses and for the activities carried out by the Enterprise in accordance with article 170 and Annex IV, article 12, of the Convention.

(c) The States Parties shall thereupon be notified by the Enterprise, through the Authority, of their respective shares in accordance with paragraph 2, required for such expenses. The Enterprise shall encash such amounts of the promissory notes as may be required to meet the expenditure referred to in the schedule with respect to interest-free loans.

(d) States Parties shall, upon receipt of the notification, make available their respective shares of debt guarantees for the Enterprise in accordance with paragraph 2.

5. (a) If the Enterprise so requests, States Parties may provide debt guarantees in addition to those provided in accordance with the scale referred to in paragraph 2.

(b) In lieu of debt guarantees, a State Party may make a voluntary contribution to the Enterprise in an amount equivalent to that portion of the debts which it would otherwise be liable to guarantee.

6. Repayment of the interest-bearing loans shall have priority over the repayment of the interest-free loans. Repayment of interest-free loans shall be in accordance with a schedule adopted by the Assembly, upon the recommendation of the Council and the advice of the Governing Board. In the exercise of this function the Board shall be guided by the relevant provisions of the rules, regulations and procedures of the Authority, which shall take into account the paramount importance of ensuring the effective functioning of the Enterprise and, in particular, ensuring its financial independence. 63/

63/ Annex IV, article 11 (3).

7. Funds made available to the Enterprise shall be in freely usable currencies or currencies which are freely available and effectively usable in the major foreign exchange markets. Except as provided in article 27, no State Party shall maintain or impose restrictions on the holding, use or exchange by the Enterprise of these funds. 64/

Article 29

Funds, assets and expenses

The funds, assets and expenses of the Enterprise shall be kept separate from those of the Authority. This provision shall not prevent the Enterprise from making arrangements with the Authority regarding facilities, personnel and services and arrangements for reimbursement of administrative expenses paid by either on behalf of the other. 65/

Article 30

Annual audit

The records, books and accounts of the Enterprise, including its annual financial statements, shall be audited annually by an independent auditor appointed by the Council. 66/

Section 11. SETTLEMENT OF DISPUTES

Article 31

Jurisdiction

The Sea-Bed Disputes Chamber shall have jurisdiction in disputes with respect to activities in the Area between parties to a contract, being States Parties, the Authority or the Enterprise, State enterprises and natural or juridical persons referred to in article 153, paragraph 2 (b), of the Convention, concerning:

(a) the interpretation or application of a relevant contract or a plan of work, or

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64/ Annex IV, article 11 (3) (g). It should be noted that these currencies will have to be defined in the rules, regulations and procedures of the Authority in accordance with prevailing international monetary practice.

65/ Annex IV, article 11 (4).

66/ Annex IV, article 11 (5).

/...

(b) acts or omissions of a party to the contract relating to activities in the Area and directed to the other party or directly affecting its legitimate interests. 67/

Article 32

Interpretation or application of a contract

1. Disputes concerning the interpretation or application of a contract referred to in article 31, subparagraph (a), shall be submitted, at the request of any party to the dispute, to binding commercial arbitration, unless the parties otherwise agree. A commercial arbitral tribunal to which the dispute is submitted shall have no jurisdiction to decide any question of interpretation of the Convention. When the dispute also involves a question of the interpretation of Part XI and the Annexes relating thereto, of the Convention, with respect to activities in the Area, that question shall be referred to the Sea-Bed Disputes Chamber for a ruling.

2. If, at the commencement of or in the course of such arbitration, the arbitral tribunal determines, either at the request of any party to the dispute or *proprio motu*, that its decision depends upon a ruling of the Sea-Bed Disputes Chamber, the arbitral tribunal shall refer such question to the Sea-Bed Disputes Chamber for such ruling. The arbitral tribunal shall then proceed to render its award in conformity with the ruling of the Sea-Bed Disputes Chamber.

3. In the absence of a provision in the contract on the arbitration procedure to be applied in the dispute, the arbitration shall be conducted in accordance with the UNCITRAL Arbitration Rules or such other arbitration rules as may be prescribed in the rules, regulations and procedures of the Authority, unless the parties to the dispute otherwise agree. 68/

Section 12. LIABILITY

Article 33

Liability

The Enterprise shall not be liable for the acts or obligations of the Authority, nor shall the Authority be liable for the acts or obligations of the Enterprise. 69/

67/ Article 187 (c).

68/ Article 188 (2).

69/ Annex IV, article 2.

Article 34

Limitation of liability of the members of the Authority

Without prejudice to Annex IV, article 11, paragraph 3, of the Convention, no member of the Authority shall be liable by reason only of its membership for the acts or obligations of the Enterprise. 70/

Section 13. PRIVILEGES AND IMMUNITIES

Article 35

Position of Enterprise with regard to judicial process

Actions may be brought against the Enterprise only in a court of competent jurisdiction in the territory of a State Party in which the Enterprise:

(a) has an office or facility;

(b) has appointed an agent for the purpose of accepting service or notice of process;

(c) has entered into a contract for goods or services;

(d) has issued securities; or

(e) is otherwise engaged in commercial activity. 71/

Article 36

Immunity of the property and assets

1. The property and assets of the Enterprise, wherever located and by whomsoever held, shall be immune from all forms of seizure, attachment or execution before the delivery of final judgement against the Enterprise. 72/

2. The property and assets of the Enterprise, wherever located and by whomsoever held, shall be immune from requisition, confiscation, expropriation or any other form of seizure by executive or legislative action. 73/

70/ Annex IV, article 3.

71/ Annex IV, article 13 (3) (a).

72/ Annex IV, article 13 (3) (b).

73/ Annex IV, article 13 (4) (a).

/...

Article 37

Exemption from restrictions, regulations, controls and moratoria

The property and assets of the Enterprise, wherever located and by whomsoever held, shall be free from discriminatory restrictions, regulations, controls and moratoria of any nature. 74/

Article 38

Respect for local laws and regulations

The Enterprise and its employees shall respect local laws and regulations in any State or territory in which the Enterprise or its employees may do business or otherwise act. 75/

Article 39

Rights, privileges and immunities

States Parties shall ensure that the Enterprise enjoys all rights, privileges and immunities accorded by them to entities conducting commercial activities in their territories. These rights, privileges and immunities shall be accorded to the Enterprise on no less favourable a basis than that on which they are accorded to entities engaged in similar commercial activities. If special privileges are provided by States Parties for developing States or their commercial entities, the Enterprise shall enjoy those privileges on a similarly preferential basis. 76/

Article 40

Special incentives, rights, privileges and immunities

States Parties may provide special incentives, rights, privileges and immunities to the Enterprise without the obligation to provide such incentives, rights, privileges and immunities to other commercial entities. 77/

74/ Annex IV, article 13 (4) (b).

75/ Annex IV, article 13 (4) (c).

76/ Annex IV, article 13 (4) (d).

77/ Annex IV, article 13 (4) (e).

Article 41

Tax status

The Enterprise shall negotiate with the host countries in which its offices and facilities are located for exemption from direct and indirect taxation. 78/

Article 42

Waiver

The Enterprise may waive any of the privileges and immunities conferred upon it under this section or in special agreements concluded by the Enterprise, to such extent and upon such conditions as it may determine. 79/

Section 14. PROCUREMENT

Article 43

Procurement

1. If the Enterprise does not possess the goods and services required for its operations it may procure them. For that purpose, it shall issue invitations to tender and award contracts to bidders offering the best combination of quality, price and delivery time.

2. If there is more than one bid offering such a combination, the contract shall be awarded in accordance with:

(a) the principle of non-discrimination on the basis of political or other considerations not relevant to the carrying out of operations with due diligence and efficiency; and

(b) guidelines approved by the Council with regard to the preferences to be accorded to goods and services originating in developing States, including the land-locked and geographically disadvantaged among them.

3. The Governing Board may adopt rules determining the special circumstances in which the requirement of invitations to bid may, in the best interests of the Enterprise, be dispensed with. 80/

78/ Annex IV, article 13 (5).

79/ Based upon Annex IV, article 13 (7).

80/ Annex IV, article 12 (3).

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EXPLORATION FOR DEEP SEA POLYMETALLIC NODULES

Working paper by the Secretariat

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I. Introduction

1. This paper was prepared at the request of Special Commission 2 to assist its first discussion of the implementation of paragraph 12(a) of resolution II in respect of exploration (see LOS/PCN/L.65, paragraph 29). In looking at the issues that have to be addressed before commercial viability can be established, it draws upon previous papers of the Preparatory Commission that relate to exploration. These include LOS/PCN/L.1 (Pioneer Activities Leading up to the Determination of the Technical and Economic Feasibility of Exploiting Polymetallic Nodules) LOS/PCN/L.56 (Current Status of Deep Sea Exploration and Mining Technology) as well as the working papers on training (LOS/PCN/SCN.2/WP.9/Add.1, 11 and 13)

2. Deep seabed mining is a nascent industry that needs to convert a unique type of mineral occurrence in a relatively unknown environment, into a source of metal in order for it to be considered established. The term "mineral" has several connotations. As used by a mineralogist, it may refer to a naturally occurring, solid, inorganic substance that can be described by a chemical formula. As used by mineral economists, it may refer to a commercially traded commodity derived from a naturally occurring, nonliving, organic or inorganic, solid, liquid or gaseous substance that is useful, or believed to be potentially useful to man.

3. The perceived potential use of a mineral is an important part of the concept of mineral resources. Thus estimates of resources do not represent permanently fixed quantities; they may change over time as uses are found for naturally occurring substances previously thought to be worthless and as technologies are devised to recover valuable products from deposits once considered too lean, refractory, or inaccessible to have any potential use.

4. Once use has been established, the objective of a prospecting (or reconnaissance) and subsequent exploration campaign for a given mineral occurrence is to establish the existence and exploitability of deposits containing that mineral. Existence and exploitability are, therefore, the major attributes used to classify the relative immediacy of the availability for use of mineral resources. Existence is a geological phenomenon best expressed by quantity and grade (metal content). By specifying the volume of the ore rock at certain grades, an estimate of the quantity of metal that may be recovered from mining and processing the ore deposit may be obtained. Exploitability is a function of economics (cost of mining, revenues from metal sales, etc.), technology and institutional factors (existence of appropriate mining regulations, environmental protection, etc).

5. The convergence of these two attributes and the degree of certainty that can be ascribed to each of them, results in the classification used by mineral economists to categorize minerals. On one end of the classification is a mineral occurrence or a deposit that is known to exist, but with no medium-term

prospect as to its exploitability. On the other end is a mineral reserve or a deposit that can be worked under existing economic, social and political conditions, at a profit. The term resource covers the whole spectrum and therefore includes subeconomic and undiscovered categories as well as reserves. The term subeconomic is inclusive of all the possible permutations and combinations of inappropriate technology, non-competitive cost of production and poor metal prices. Thus a resource ceases to be categorized as subeconomic when:

(i) the technology for exploiting it is proven;
(ii) production costs are competitive; and,
(iii) metal market prospects are favourable.

6. The existence of polymetallic nodules was established in 1873 during the voyage of H.M.S. Challenger. Dramatic achievements in the understanding of these deposits and their "exploitability" were made in the 1970s as a result of large-scale reconnaissance and environmental work on Pacific Ocean Polymetallic nodule deposits, often as international co-operative efforts given the high costs involved. It was in that same era that an International Decade of Ocean Exploration was established. Contributions to this effort were made by the United States (through the National Science Foundation and other U.S. based organizations), France (through the Centre National pour 1' Exploration des Oceans), the Union of Soviet Socialist Republics (through the P.P. Shirshov Institute of Oceanology), Japan (through the Geological Survey of Japan), New Zealand (through its Institute of Oceanography), and Federal Republic of Germany (through the Bundesanstalt fur Geowissen schaften und Rohstoffe).

7. Many cruise reports and scientific papers came out of these efforts and more detailed investigative work then focussed on the deposits of the equatorial Pacific polymetallic nodule belt. While the extraction and processing techniques for these deposits were being studied, recovery systems for polymetallic nodules in the form of hydraulic lifting devices were tested and investigated on a small scale.

8. As a result of these efforts, Registered Pioneer Investors as well as potential applicants to the Preparatory Commission in the nascent deep sea polymetallic nodule mining industry are presently at a stage where they have appraised large areas of the seabed (the Clarion-Clipperton zone in the Pacific and the Central Indian Ocean Basin in particular), undertaken a considerable amount of the general engineering and design work required to explore for and recover nodules from the sea-bed, and established a number of the basic metallurgical process routes required to convert polymetallic nodules into the four main metals of economic interest (nickel, cobalt, copper and manganese).1/ These efforts, that have culminated in the registration of

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1/ For a more detailed discussion of the above see the United Nations Sea-Bed Mineral series, Vol. 1 - Assessment of Manganese Nodule Resources (1982), Vol. 2 - Analysis of Exploration and Mining Technology for Manganese Nodules (1984) and Vol. 3 - Analysis of Processing Technology for Mangenese Nodules (1984 (London, Graham and Trotman).

/...

sites in the Clarion-Clipperton Zone in the Pacific and the Central Indian Ocean Basin, have upgraded the deposits in these areas to identified subeconomic resources.

9. This categorization underscores the task of exploration (for which a Registered Pioneer Investor acquires the exclusive rights by registering a site), which is to confirm that a candidate ore body is in fact a deposit of economic interest. In this case, it will mean;

(a) detailed regional appraisal of claim sites (allocated and reserved) to select the best areas for possible commercial recovery of ore and to develop of a better understanding of the factors which control the genesis of polymetallic nodules;

(b) detailed appraisal of target areas within the claim site which would consist of characterization and modelling of the deposit, and of the variability of the terrain in order to design the mining vehicle; and,

(c) detailed three dimensional sampling and preliminary evaluation which would result in the delineation and selection of initial mining sites based on detailed studies.

10. The selection of the best areas for exploitation will be based on inter alia, contour maps of the deposit and its terrain parameters, and combinations of these two parameters. While these maps will be constructed incorporating standard contouring approaches, more sophisticated geostatistical techniques and trend analyses will also be utilized. The approach will be iterative in the sense that as the variability of the critical parameters is better understood, this information will be used to plan more efficient survey patterns for the collection of each type of data. Correlation studies between parameters will also allow a greater use of remote sensing techniques. Baseline studies with intensive sampling are still needed, however, to refine the present understanding of these correlations.

11. The purpose of this report is to review the present status of the nascent industry with regard to the exploration phase of allocated and reserved areas and provide a summary of the activities required to establish these deep sea polymetallic nodule deposits as reserves. Does granting a license for exclusive rights to undertake exploration in a given area at the present time indicate that economic target areas are available? The literature in the public domain would suggest that the present status of the nascent industry is one that is still involved in prospecting/reconnaissance. Certainly, it is no further along than having identified promising regions, so that the next step is to define target areas of economic potential and to thus begin to delineate them.

II. The Prospecting Phase (Achievements and Unresolved Problems)

12. Prospecting or reconnaissance in a polymetallic nodule mining programme is that operation conducted for the purpose of mapping, sampling bottom or

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sub-bottom materials, taking geophysical or geochemical measurements or comparable activities in such a manner as not to significantly alter the surface or subsurface of the deep sea-bed. In general, prospecting activities are carried out prior to the granting of exclusive rights to explore and exploit a specific claim site. By its nature, prospecting requires freedom to search wherever minerals might occur, flexibility in applying innovative concepts and methods and alacrity in responding to new knowledge. Prospecting's ultimate objective is to identify promising regions and target areas of economic potential. By the very fact that it is unproven, deep sea polymetallic nodule mining creates an enigma.

a. Reconnaissance Work

13. The extent of knowledge of the deep sea-bed, in particular its resources and the environmental conditions thereof, is miniscule. Since the unexplored areas of the ocean floor are vast and much larger than any terrestial mineral exploration project, marine mineral exploration relies first of all on the mapping of the ocean floor. Most areas of the ocean floor have not been mapped on an appropriately fine scale to allow for effective marine mineral exploration work. The reason for this lies in slow-speed single-line echosounder systems that were in use up to the 1970s. Considering the cost of running a ship, it is understandable that the lengthy detailed bathymetric mapping of ocean floor areas was considered somewhat luxurious; therefore, very few areas of the deep oceans have been mapped at an appropriate scale, that is, with topographical line spacing of 100m.

14. To show the typical process that has been the rule for all Registered Pioneer Investors we take the French as an example. In describing the large grid operations for sampling and surveying employed during the prospecting programme undertaken by AFERNOD (Association Française d'Etudes et de Recherche des Nodules) during the 1970s that subsequently led to the registration of a pioneer area of 75,000 sq km in the Clarion-Clipperton zone for the Government of the Republic of France, H. Bastien-Thiry states:

> "The distance between adjacent localities, i.e. the length of each side of the unit square was 50 nautical miles (93 km). That value was chosen on the basis of the results of a first geostatistical study which we performed by using the variogram method. From the results we had at that time, in addition to information in the relevant literature, we came to the conclusion that if, over a distance of approximately 100 km, nodule grade remained relatively constant (i.e. within two adjacent localities thus investigated, assays of the corresponding samples give the same values in copper, nickel and cobalt), there was every chance of that value remaining the same along the profile from one locality to next. In each locality we performed two types of work: accurate measurements; and more qualitative determinations, for lack of equipment capable of obtaining very exact figures. Accurate measures consist

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> primarily of measurements characterizing the nodule ore, i.e. its content in terms of economically interesting elements and its abundance on the ocean floor; in addition, the bathymetric surveys performed during these cruises allowed us to determine the average water depth of the areas explored; finally, a certain number of systematic measurements were made to characterize the nodule 'environment'. Qualitative measurements provide a rough evaluation of the underwater relief (rough because the surface echosounder did not have a very high power of resolution at water depths of 5,000 metres)."2/

15. In summarizing the results of their work with this large grid system, Mr. Bastien-Thiry pointed out that from the measurements obtained with respect to nodule grade and concentration at each of 300 localities, they evaluated the total tonnage of recoverable metals in a 2.2 million square kilometre zone and selected, within this area, the sector appearing to be the most favourable for additional work.

16. With regard to the value of their estimates Mr. Bastien-Thiry further went on to state:

> "Two factors must be taken into consideration: (1) the accuracy of the basic parameters, particularly as concerns nodule concentration on the ocean floor; and (2) the representativeness of the whole conglomerate of measurements with respect to the totality of the area considered.
>
> As to the accuracy of the concentration measured, we may recall the considerations developed above as to the methods employed to calculate this parameter. We know that despite all the precautions and all the care taken, in the final analysis the nodule concentration figure may be as much as 50 percent off.
>
> Regarding the representativeness of the measurements, 2000 measurements were made. Each one covered roughly 1 m^2. We have thus operated on a cover of 2×10^{-3} km.
> In other words, the total area of the region considered is 10^9 (a billion times) larger than the area surveyed. Such a ratio is, naturally mind boggling!"3/

2/ In Manganese Nodules: Dimensions and Perspectives. Chapter 2 - Sampling and Surveying Techniques by Hubert Bastien-Thiry. Prepared by the United Nations Ocean Economics and Technology Office, 1979. Published by D. Reidel Publishing Company, Dordrecht, Holland.

3/ Manganese Nodules: Dimensions and Perspectives, Op. Cit.

Notes: Nodule concentration is a measure of nodule weight per unit area.

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17. Mr. Bastien-Thiry concluded his report by stating:

> "From the mass of experimental data obtained from small areas, we extrapolated the total potential ore body, without, however losing sight of the uncertainty involved in such an ambitious assessment. We are fully aware that more sophisticated techniques of observation and measurement than those used in the work carried out to date will have to be developed. I shall conclude with this important remark; the main purpose of our exploratory work was not to determine the actual number of mine-sites having the required characteristics, but through comparative measures to choose the sector within the zone investigated constituting the most attractive potential ore body. This we believe has been accomplished even if much further work still remains to be done before this area can be legitimately considered a true nickel, copper, cobalt and manganese deposit.[4]"

18. Again, in the subsequent French application, data on 122 locations in a 230,440 sq km area were provided.[5] Each location was described as a cluster of 1 to 7 (average 4) stations where photographs of the bottom and nodules samples were obtained. In the western region of the claim area, the distance between locations varied from 20 to 60 km, while it varied form 10 to 30 km in the central region of the application area.[6] The total area of the region considered is 4 x 10^{10} (or 40 billion) times larger than the area surveyed. Obviously this ratio is too large and would have to be reduced by several orders of magnitude to establish confidence.

19. In effect, the general area of interest was pinpointed at an early stage and did not change.

20. In this next phase, in order to improve the quantity and the spatial density of data and thus reduce risk with regard to *inter alia*, knowledge of the distribution of nodule grade, nodule abundance and the topography of the area, including obstacles therein, it has been suggested that two methods can

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[4] Manganese Nodules: Dimensions and Perspectives. *Op. Cit.*

[5] Law of the Sea Bulletin: Special Issue II. Registration of Pioneer Investors in the International Sea-Bed Area in accordance with Resolution II of the Third United Nations Conference on the Law of the Sea. April 1988. U.N. Office for Ocean Affairs and the Law of the Sea.

[6] Law of the Sea Bulletin: Special Issue II. *Op. Cit.*

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be pursued simultaneously, the development of visual methods to "see" the nodules more effectively, and the development of the appropriate statistical, geologic and geomorphologic models to progressively establish similarities in areas.[7]

b. Bathymetric Mapping of the Ocean Floor[8]

21. There has been considerable progress during the past decade, albeit insufficient, in respect of mapping the ocean floor. Multiple echosounder systems developed by the U.S Navy are now commercially available. These systems, although quite expensive have been installed on a number of research vessels. The systems continously generate topographical maps along the ship's track and are most effective in deep water. The main reason for this is that due to the installation of the echosounder array around the ships outcrop, the width of the mapping strip is 75 percent of that of water depth; that is at a water depth of 2,000m, the mapped strip of the ocean floor is 1500m wide. Topographical relief of about 10m can be mapped precisely with such a system.

c. Geophysical Mapping Techniques[9]

22. Marine geophysical techniques,which, of course include the above - mentioned techniques (echosounder systems), incorporate mainly other acoustic, seismic, gravity and magnetic measurements. As a result of the high hourly cost of operating a ship, the development of towed platforms with arrays of geophysical instrumentation is important. They usually consist of optical instruments in the form of under water cameras (video) and side-scan sonar systems or sub-bottom profilers. In all cases, measurements are aimed at large area coverage so that distances between profilers can be reduced considerably. Although a number of integrated systems are already on the market, new technological advances are needed to stimulate further developments.

23. Geophysical instrumentation for the inspection of the deep ocean floor was recently described, using the Deep-tow System, a near-bottom towed vehicle, as an example.[10] The techniques traditionally used by these deep-towed underwater vehicles or platforms are side-looking sonar devices, sub bottom profilers, magnetometers, T.V and still cameras, as well as classical devices

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7/ Jean-Pierre Lenoble. Preliminary Exchange of views on exploration under Resolution II, paragraph 12.

8/ Kunzendorf, H. "Proposed Marine Mineral Exploration strategies for the Nineties". Marine Mining Vol   ,1988.

9/ Kunzendorf, H. "Proposed Marine Mineral Exploration Strategies for the Nineties". Op. Cit.

10/ Speiss, F.N. 1987. Deep-Ocean near-bottom Surveying Techniques: In P.G. Teleki et al., eds. Marine Minerals: Advances in Research and Resource Assessment. Reidel, pp 259-275.

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to measure the physical properties of seawater. At present, a number of systems have been applied at sea. The proper application and deployment of these devices, however, is based on the use of an accurate navigational system, either in the form of the Global Positioning System (GPS) or at the site in the form of transponder systems. As of 1988, the GPS system still provided insufficient satellite coverage for a number of areas in the oceans, for example, the southern part of the Indian Ocean.

24. Regarding global developments, three projects in the United States are worth mentioning: the RUM III configuration of Scripps; the Argo-Jason configuration of Woods Hole; and, the construction of a more advanced deep-tow system at Scripps.

The RUM III configuration employs a sea-floor-going vehicle for making measurements and sampling directly on the sea-floor. The Argo-Jason configuration of Woods Hole implements multisensor capabilities (Argo) with a remotely operated vehicle (Jason) for close-to-bottom inspection. Also important are developments for imaging the ocean floor by applying laser systems.11/

25. In European research on marine geophysical exploration, a widely used system has been developed by the British Institute of Oceanographic Sciences (IOS), called GLORIA. Other systems include the German High Speed Exploration System (HSES) and the French SAR system. GLORIA (Geological long-range inclined Asdic) is basically a towed, side-scan sonar swath mapping system that may be applied in both shelf areas and deep waters. At a water depth of about 500m, a side-scan sonar strip of 60km width may be mapped. Advanced computer-based interpretation techniques have to be used for correcting data (distributions and contrast variations). Being a side-scan system, GLORIA is best in sea-floor obstacle mapping showing tectonic features and fault structures. The system has been successfully applied on the U.S West Coast.

26. French developments are clearly confined to manned and unmanned vehicles for inspecting the deep sea floor. Spectacular results were obtained with the manned submersible CYANA having a depth range of 3000m. A new construction, the submersible NAUTILE, operates at depths twice as great and is able to collect a sample load of up to 200kg. It has recently been applied in investigations of the sunken M/S Titanic. As a result of its relatively small weight, this vehicle is also able to be operated from a vessel with normal displacement. An unmanned system (Epaulard) is also under construction. Similar developmental work on submersibles capable of operating at depths as much as 6000m. is taking place in Japan and Finland.

27. The newly developed French SAR towed system also has an operating depth of 6,000m. It consists of a side-scan sonar, sub-bottom profiler and several other underwater sensors. The system includes an interactive software package to manipulate the data.

11/ Dixon, T.H., T.J. Pivirotto, R.F. Chapman and R.C, Tyce. 1983. A range-gated laser system for ocean floor imaging. MTS Journal 17, 3:5-12.

28. German developments are directed toward the construction of integrated observation platforms (OFOS, Ocean Floor Observing System). Video camera systems and photographic techniques are combined with a modern telemetry system allowing programmed visual inspection of the ocean floor.

29. The prospecting devices of the Japanese consist of bottom sampling devices, visual and acoustic devices. Sampling devices consist of a free gall grab, a spade corer, an ocean grab, a piston corer, a free fall corer, dredging buckets and power grab with a colour TV system. Finally acoustic devices include an Air-Gun, a sub-bottom profiler, precision depth recorders, a narrow beam sounder multi-frequency exploration system and side-scan sonar.[12/]

30. Noting the advantages of underwater television cameras, particularly in obtaining continuous and instantaneous pictures, the conventional coaxial two cable system has been replaced in the Japanese system by a composite fiber optical coaxial deep-sea towed cable system. The cable contains two optical fibers and is 12,000m in length allowing the reception of clear images of the sea bottom continuously. At completion, the Multi-Frequency Exploration Data Processing System (MFES) of the Japanese consisted of

(i) an interface with acoustic sounding instruments;
(ii) an analog signal processing unit;
(iii) a digital signal processing unit; and,
(iv) an output display unit.

d. Geochemical Sampling and Characterization[13/]

31. Sometimes geochemical techniques are applied during geophysical exploration work. Depending on water depth, geochemical work includes sampling, chemical analysis and geochemical interpretation.

32. Sampling is carried out from the ship either in the form of free-fall sampling devices or by cable-mounted sampling equipment. Much of the equipment has been used for years in normal oceanographic work and is well known from the literature.[14/] For exploration purposes, sampling has to be conducted in a more systemmatic manner. For instance, sampling of polymetallic nodule fields requires grid sampling by, for example, free-fall grabs to determine the grade of the nodules and their surface density.

12/ K. Shuto, Exploration Technology for the Deep Sea-Bed. Preliminary exchange of views on exploration under Resolution II, paragraph 12, 30 August 1988.

13/ Kunzendorf, H. Proposed Marine Mineral Exploration Strategies for the Nineties. Op. Cit.

14/ Kunzendorf, H., ed. 1986. Marine Mineral Exploration, Elsevier, 300p.

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33. Chemical analysis of recovered samples is either carried out directly on board ship or conducted at a land-based laboratory. A number of research vessels conducting marine mineral exploration work have installed X-ray flourescent instrumentation as a standard analytical tool, but many of the exploration groups chartering these ships used their own equipment based on more or less advanced chemical procedures. X-ray flourescent equipment is well-suited to the analysis of sediments and polymetallic nodules, and this method has been used extensively in the geochemical characterization of equatorial North Pacific polymetallic nodules.[15]

e. Data Quality

34. Data quality has long been of concern. The problems were best summarized by Jane Frazer in 1979.[16] With regard to improving the quality of data on element concentrations in manganese nodules, it has been recommended inter alia, that

(i) Results would be most consistent (but not necessarily more accurate) if a single investigator analysed all samples. This is impossible and probably undesirable. We need a number of people actively involved in studying nodules so that there will be many people capable of evaluating the analytical results. We must be concerned with the acceptability as well as the accuracy of the analysis. Consistency between analyses performed by different scientists using different methods can be greatly improved by increased exchange of samples and standards among as many investigators as possible. If different analysts are getting widely different results from the same materials, they need to find our why and correct the problems, not just gossip about the quality of each other's work;

(ii) A wider range of manganese nodule calibration standards is needed.

15/ Friedrich, G., W. L. Pluger and H. Kunzendorf, 1974. Shipborne geochemical investigations of deep sea manganese nodule deposits in the Pacific using a radiosotope energy-dispersive X-ray System. J. Geochen Explor. 3:303-317.

16/ Frazer, J., The reliability of available data on element concentrations in sea-floor manganese nodules. In Manganese Nodules: Dimensions and Perspectives, 1979. Prepared by the United Nations Ocean Economics and Technology Office. Reidel.

(iii) The best information for economic evaluations comes from analysing samples that represent the total collection of nodules at a particular location: several samples or a composite which accurately represent the nodule types and size ranges found at the site.

(iv) We should not expect all scientists to be interested in analysing representative bulk samples. In fact, if we do only bulk analyses we may miss important clues to nodule development. It would be very helpful, however, if scientists who do choose to make special studies of parts of nodules could make their leftover nodules available to other investigators for bulk analyses.

(v) We need more information that will enable us to relate nodule grade to concentration. If at all possible, information on nodule concentration obtained form weighing the totality of nodules collected in a grab sampler or box core, and accompanying sea-floor photographs should be made available. Persons collecting nodules for analysis should make an effort to use sampling devices that can given an indication of nodule concentration.

f. Data Evaluation and Survey Interpretation

35. Marine geophysical and geochemical surveys usually collect large amounts of data. Although a number of geophysical mapping tools generate maps along the ship's track directly (for example, seabeam), detailed data are generally stored on magnetic tape in the computer of the ship. This is done for several reasons. Ship tracks usually have to be corrected for deviations caused by navigational inaccuracies. An example is the varying and often intermittent availability of satellite fixes for global positioning. At some remote areas, satellite data are unavailable for hours, requiring frequent corrections to coordinates and bathymetric data. The placement of sampling or measurement stations have sometimes turned out to be far away from their anticipated site. New bathymetric charts then have to be produced by computer. Also, if the sea state is unfavourable, ship tracks that were planned to be overlapping must be corrected for deviations and in the worst case, interpolation of ship track data with significant distances between planned tracks must also be carried out by computer.[17]

36. Most geological, geophysical and geochemical data are stored and interpreted by large or micro computers. Briefly, data evaluation and interpretation work starts with the construction of databases. Once the

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17/ Kunzendorf, H., Proposed Marine Mineral Exploration in the Nineties. Op. Cit.

database has been established, it can be used for data management, for example searching through the database. Data are then subjected to data structural analysis, that is to standard statistics, multivariate statistics and geostatistical methods.[18]

III. Detailed Reconnaissance of Favourable Areas

37. On the basis of the information available in the public domain on the resource assessment work undertaken on deep sea polymetallic nodules so far, it may be said that Registered Pioneer Investors (RPI's) and Potential Applicants (PA's) have completed the first stage of the four stages that comprise full sequence mineral exploration.

38. The four stages of full sequence exploration are recognized as the following:

Stage 1 - Regional appraisal
Stage 2 - Detailed reconnaissance of favourable areas
Stage 3 - Detailed surface appraisal of target areas, and
Stage 4 - Detailed three-dimensional sampling and preliminary evaluation.

Even when undertaken in a onetime sequence, the four stages would still be recognizable.

39. From their work, RPIs and PAs have appraised large areas of the seabed and undertaken a considerable amount of the general engineering and design work required to outline and embark on the detailed reconnaissance phase in any of the allocated areas or the areas reserved for the Authority.

40. For the most part, the information available to them consists of data on nodule abundance and grade, bathymetry and geomorphology. For the four sites in the Clarion-Clipperton Zone,[19] data have been obtained from stations regularly spaced on sampling grids that vary as follows:

(a) France

Data on 122 locations in the application area of 230,440 sq km. In the Western region the distance between locations varies from 20 to 60km, while it varies from 10 to 30km in the Central region.

18/ Lenoble, J.P., 1986. Data Evaluation of Exploration Surveys: In H. Kunzendorf, ed. Marine Mineral Exploration. Elsevier, pp. 157-189.

19/ Comparable Information on India
Data from 400 stations in the application area of 300,000 sq km.

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(b) Japan

Data from 559 station locations in the application area of 225,000 sq km. The averge area per station is 403 sq km. Stations are regularly spaced on a sampling grid approximately 20km apart.

(c) Soviet Union

Data from 1,177 sample locations in the application area of 207, 328 sq km. The sample locations are regularly spaced on a sample grid 13km apart.

41. Clearly, in all cases,either a much larger number of samples will need to be taken to increase the spatial extent of the data or, visual methods, coupled with the appropriate statistical and geostatistical models will have to be developed.

42. Since the site reserved for the Authority in the Central region had been prospected by three Registered Pioneer Investors and is to be found in the same geographical area for which "technology" has been designed but is yet to be tested, the same considerations with respect to additional work required for these allocated areas would apply to the reserved area.

a. Nature of an Exploration Plan

43. The activities to be undertaken as part of an exploration plan would have as their basis, the resolution of the remaining unknown factors that may affect the delineation of potential mine sites. First would be to increase understanding of nodule deposit characteristics in general, with a particular emphasis on the extent and distribution of mineable patches. Other factors which require additional study involve the difficulty of mining, or mineability of attractive deposits. The components of mineability include the detailed morphology of the seafloor, the distribution of obstacles in areas of attractive deposits and the properties of seafloor sediments that may affect a mining operation.

44. Given the fact that current methods for establishing the size, abundance and ore grade characteristics of polymetallic nodule deposits rely upon direct sampling or low-speed deep tow surveys, both of which are very costly and produce data which are either low in spatial density or extent, techniques which allow operation at cruising speed, while providing continuous data, will greatly reduce the cost of obtaining this information. Development of high resolution tools to measure seafloor morphology will center around testing of surface multiple beam systems and development of software which will ultimately yield improved mineability information.

45. A complete exploration plan at this stage will, therefore, consist of the following major activities:

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(i) equipment development studies;
(ii) upgrading survey equipment;
(iii) upgrading the survey ship;
(iv) survey operations; and,
(v) data analysis and ore assays

b. Reserved areas

46. A reserved area would, in general, have the same characteristics in respect of amount and degree of reliability of data as a pioneer area. A plan for detailed reconnaissance of any of these areas, therefore, would have to include surveys to improve data coverage and reliability. Since exploration by its very nature implies dealing with the unknown, and because of the fact that in spite of the best possible predictive efforts, the exploration specialist copes with natural occurrences which are highly unpredictable, the plans and choices of methods must be reviewed continuously as new results are obtained. If the results of this preliminary phase suggest that detailed appraisal of target areas is warranted, then a further plan covering this phase can then be formulated and, as appropriate, implemented.

47. There is a paucity of information available for converting polymetallic nodule deposits from their current status as identified subeconomic resources to reserves. At the same time, the current projections for the metals to be obtained from deep sea-bed mining, the need for further development of the requisite technology for "all phases" of exploration, and the requirement that any measures be cost-effective, indicate that the only viable option would be to concentrate exploration efforts to the extent possible, involve as many of the Registered Pioneer Investors as may be appropriate, and couple these efforts with a specialized training programme. The value of introducing a training component into exploration plans under Resolution II has been discusssed in earlier Working Papers (e.g. LOS/PCN/SCN.2/WP.11, paragraphs 25-28).

48. Indeed, it has long been assumed that one optional approach to the exploration of reserved areas under Resolution II would be to invite co-operative efforts on the part of interested Registered Pioneer Investors. It remains true that it is the first mining operation of the Enterprise that holds the most importance.

49. In the particular case of the reserved area in the central zone of the north-east Pacific to which contributions were made by France, Japan and the Soviet Union, any requests for exploration by the Preparatory Commission, involving any part of that area, would entail an additional consideration.20/ Since, for that particular reserved area, there are three

20/ Contributions to this area were made as follows:

(i) France - an area totalling 20,000 sq km adjacent to its overlapping area with the Soviet Union;

(ii) Japan - an area totalling 17,300 sq km adjacent to its overlapping area with the Soviet Union; and,

(iii) Soviet Union - an area totalling 15,000 sq km, 14,549 sq km of which will be from its overlapping areas with France and with Japan and 451 sq km which is obtained from France.

separate data sets, based on different data collecting methods and technologies and on different analytical techniques, the first task would be to produce one acceptable data set from the prior work done by these Registered Pioneer Investors. Thus an initial or prior step - additional to the activities described above - would need to be incorporated within any plan of the Preparatory Commission involving exploration of any part of that particular reserved area.

50. It should be emphasized that the information obtained and the experience gained from exploration of a reserved area would be useful not only to the Enterprise but to the international community as whole. Exploration work in this context would provide the basis for future work in exploring for polymetallic nodules in the Area, with consequent benefits for the work of Registered Pioneer Investors, and also for that of the potential applicants. For the Enterprise, if a training component were also included, it would provide a pool of personnel well-trained in exploration techniques and conversant with the particular features of the area explored.

LOS/PCN/SCN.2/WP.18
9 August 1990

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2
New York, 13-31 August 1990

DRAFT BASIC JOINT VENTURE CONTRACT

(Working paper by the Secretariat)

EXPLANATORY MEMORANDUM

1. Joint venture arrangements as a method of operation for the Enterprise have been the subject of consideration by the Preparatory Commission at various times since 1983. Indeed, they were the subject-matter of extensive discussions during the Conference itself and were for a long time considered to be the norm for the operations of the Enterprise.

2. Annex III, article 11, paragraph 1, of the Convention, specifically states that:

> "Contracts may provide for joint arrangements between the contractor and the Authority through the Enterprise, in the form of joint ventures or production sharing, as well as any other form of joint arrangement ..."

3. Already at the resumed second session of the Preparatory Commission the Secretariat had submitted a background paper, "Information note on elements of joint ventures" (LOS/PCN/SCN.2/WP.3), in response to a request made by the Special Commission.*

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* See also the preliminary note submitted by the secretariat of the Asian-African Legal Consultative Committee (AALCC) of 6 February 1984 and the introduction to the Model Joint Venture Agreement for Sea-Bed Mining submitted by the Federal Republic of Germany (LOS/PCN/SCN.2/WP.5).

4. The Special Commission has looked at various operational options for the Enterprise, and in the course of those discussions it was suggested that the initial operations of the Enterprise should be through a joint venture arrangement. Indeed, the Chairman of Special Commission 2 reported to the plenary at the end of the resumed third session, on 4 September 1985, that:

> "... it is to be noted that many delegations continue to believe that a joint venture may be the most likely option for the first project of the Enterprise, from the point of view of practicality and minimization of risks. The advantages of a joint venture for both mining and processing have been stressed particularly as regards transfer of technology and development of manpower. Furthermore, some delegations have suggested that when the Special Commission takes up the question of joint ventures in detail, both equity and contractual joint ventures should be studied." (LOS/PCN/L.25, para. 16)

5. At the resumed fourth session, on 5 September 1986, the Chairman, reporting on the work of Special Commission 2, stated:

> "In the same vein, delegations have suggested that the Special Commission should restrict the scope of its recommendations on operational options, confining itself, unless conditions change, to those options that would better facilitate the start-up of operations. Particular mention has been made of the joint venture and leasing options in that context." (LOS/PCN/L.40, para. 4)

6. Furthermore, at the end of the sixth session, on 8 April 1988, the Chairman of Special Commission 2 reported that:

> "... the Special Commission predicts that it will be possible, even during the interim period, to narrow down the likely range of options that the Enterprise would consider. In this event, the work of the Special Commission would be adjusted to take this into account. Special mention was made of joint ventures and of their complexities, which would indicate the need to allow sufficient time to assemble the necessary information and prepare any working papers needed." (LOS/PCN/L.60, para. 15)

7. It is pursuant to that request for a working paper on joint ventures that the Secretariat has prepared the Model Joint Venture Contract presented below.

8. The present working paper briefly discusses the joint venture arrangements by way of an introduction to the Model Joint Venture Contract, which has been prepared for illustrative purposes. A commentary on the provisions is contained in an addendum to the paper.

9. A joint venture is one of several kinds of arrangements from which two or more entities choose the most effective and efficient mode of operations to best meet their objectives and their financial, technical and other circumstances. The joint venture arrangement differs from others in that it is a commercial relationship organized in order to carry out a particular project or venture over a comparatively long duration, which is characterized by its "jointness" or sharing of ownership, profits, risks and decision-making. This distinguishes the joint

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venture from other forms of commercial arrangements, such as service contracts, technical agreements, turnkey contracts, etc.

10. The joint venture has a flexible structure which allows for a variety of arrangements with regard to ownership, the contributions of the participants and the allocation of profits, risks and decision-making between them, none of which need bear any relationship to any of the others. This would allow a number of disparate participants of different nationalities and themselves having different forms (States, State enterprises, individuals, partnerships, corporations, other forms of enterprises or combinations thereof) to form one commercial entity for a particular venture.

11. It is important to note that the provisions in every joint venture agreement depend on the particular characteristics of the project and the objectives of each of the participants. The number of permutations and commutations in this regard are almost unlimited, but the basic provisions concern ownership, the contributions of the parties in cash and in kind (both tangible and intangible), the sharing of profits and of risks, management decisions and control, and the settlement of disputes. These are central, but a whole host of other matters need to be negotiated. Any model cannot contain all such details and choices.

12. There are two types of joint ventures: the incorporated joint venture and the contractual joint venture. The former involves sharing of ownership through a separate legal entity incorporated for that purpose. It is then a corporation under a particular municipal law and the liabilities of the participants (the equity shareholders) are limited in accordance with that law. That law sets out how the participants will make their contributions and how the profits, risks and decision-making will be shared, subject to modification by the participants within certain parameters. An incorporated joint venture as a legal entity may be subject to taxation, separate from its participants, in accordance with the laws of the country of its incorporation and the countries in which it carries on business.

13. In the contractual joint venture, no separate legal entity is established and the ownership of assets is shared; the rights and obligations of the participants are set out entirely in the contract which establishes the business relationship. As the rights and obligations of the parties are governed solely by what is agreed upon in the contract, it must state how the assets will be acquired and owned and how the participants will share the profits, risks and decision-making. While the participants can allocate liabilities as between themselves, the liabilities with regard to third parties are usually not limited, but are joint and several. However, participants usually try to limit their liabilities in a contractual joint venture by organizing a separate limited liability company, a wholly owned subsidiary, to enter into the joint venture contract and carry out its obligations. The risk is then, subject to certain exceptions, limited to the amount of the paid-in equity capital of that company. The contractual type of joint venture is often used in large construction and other projects for financing purposes where each participant makes its own financing arrangements.

14. Since a separate legal entity is not established, a contractual joint venture as such is not subject to taxation, but each of the participants is subject to

taxation in accordance with the law applicable to that participant. For that reason, this kind of arrangement has been used in multinational arrangements in a number of sectors, such as petroleum, mining and construction.

15. Thus a contractual joint venture might offer advantages for the Enterprise (which has certain privileges and immunities under the Convention) as well as for other entities.

16. Joint venture arrangements could be used for reserved and unreserved areas. There are a number of reasons for the parties to form a joint venture. It is likely that a participant might wish to enter into a Joint Venture Contract in order to limit its liabilities to the extent of its share of the joint venture pursuant to Annex III, article 11, paragraph 3. But joint ventures could also be a mechanism to provide financial incentives to contractors by providing them with faster cash flows, thus enabling them to begin sea-bed mining earlier than otherwise. In this respect, the contractual form could be more advantageous than the incorporated form, as cash flows could be more direct and not dependent on the declaration of dividends.

17. The joint venture arrangement could also be used to limit the capital and loan requirements of the Enterprise and to reduce risks and liabilities. In doing so, the Enterprise would also be able to start operations at an earlier time than might otherwise be financially possible.

18. Joint ventures could also provide a mechanism for the Enterprise to obtain technology and to train personnel so as to become operational sooner than might otherwise be the case.

19. The model contract which follows has been prepared for an incorporated joint venture, which is still the more usual form, though contractual joint ventures have been increasingly popular in recent years in a number of countries with widely differing economic systems. The model could be readily adapted to a contractual joint venture by including the standard provisions which form part of the rules governing incorporated companies in national laws. Those provisions were not reproduced as they would only add bulk to the model without adding much to the principles of joint venture arrangements at the current stage.

20. The use of the term "Participant" in the model contract is not to be construed as precluding more than one entities in their joint or several capacities entering into joint venture arrangements with the Enterprise.

21. The article-by-article commentary on the various sections of the model contract which is issued as an addendum to the present working paper is designed to assist the Commission in its consideration of the paper.

JOINT VENTURE CONTRACT

BETWEEN

THE ENTERPRISE OF THE INTERNATIONAL SEA-BED AUTHORITY

AND

____

(State or Entity)

THIS CONTRACT, made the _____ day of _________________, between the Enterprise (hereinafter called "the Enterprise") of the International Sea-Bed Authority (hereinafter called "the Authority") and ______________________________ (State or Entity), ________________________________ (Legal status) (hereinafter called "the Participant");

WHEREAS:

1. The Enterprise is the organ of the Authority which carries out activities in the sea-bed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction;

2. The Enterprise and the Participant have agreed to form a joint venture company to carry out (exploration) (exploitation) (exploration and exploitation) in accordance with the terms and conditions of this contract;

NOW, THEREFORE, the Enterprise and the Participant agree as follows:

SECTION 1

Definitions

For the purpose of this contract:

1.1 "affiliate" means any person, firm or company, directly or indirectly controlling, controlled by or under common control with the Participant. For purposes of this definition, "control" means the power to direct management and policies;

1.2 "applicable law" means the law applicable to this contract in accordance with Section 22;

1.3 "approved plan of work" means the contract containing the plan of work referred to in Section 2.3;

1.4 "area covered by this contract" means the sea-bed and ocean floor and subsoil of the area defined by the co-ordinates listed in Annex A;

1.5 "Convention" means the 1982 United Nations Convention on the Law of the Sea;

1.6 "Authority" means the International Sea-Bed Authority established by the Convention;

1.7 "Joint Venture Company" means the joint venture company formed pursuant to Section 6.1;

1.8 "regulations" means the rules, regulations and procedures of the Authority.

SECTION 2

Scope

2.1 This contract is a Joint Venture Contract.

2.2 The Enterprise and the Participant shall form the Joint Venture Company to carry out (exploration) (exploitation) (exploration and exploitation) of polymetallic nodules from the area covered by this contract in accordance with sound market principles.

2.3 The Joint Venture Company shall apply to the Authority for approval of a plan of work for (exploration) (exploitation) (exploration and exploitation) in accordance with the regulations. Upon approval by the Council of the Authority, the Joint Venture Company shall enter into a contract with the Authority for the plan of work for (exploration) (exploitation) (exploration and exploitation) for the area covered by this contract. In the event that the Participant has already obtained the contract, the contract shall be assigned to the Joint Venture Company in accordance with the regulations.

/...

2.4 The Participant shall be the manager of the Joint Venture Company from the date of its formation until _________ and shall be responsible for the Joint Venture Company's carrying out activities under this contract with efficiency and economy in accordance with sound commercial principles and in compliance with applicable law and the terms and conditions of this contract, the approved plan of work and the regulations. Thereafter the Enterprise shall be the manager of the Joint Venture Company and shall have such responsibility.

SECTION 3

Term

Subject to Section 17, the term of this contract shall begin on the date hereof and end upon the expiration or termination of the approved plan of work.

SECTION 4

Responsibilities of the Participant

The Participant shall:

(a) carry out the activities under this contract as manager of the Joint Venture Company in accordance with Section 2.4;

(b) thereafter, co-operate with the Enterprise so as to facilitate its performance as the manager of the Joint Venture Company.

SECTION 5

Responsibilities of the Enterprise

The Enterprise shall:

(a) furnish to the Joint Venture Company all relevant information held by it or by the Authority relating to the area covered by this contract;

(b) co-operate with the Participant so as to facilitate its performance as the manager of the Joint Venture Company until the date specified in Section 2.3;

(c) thereafter carry out the activities under this contract as manager of the Joint Venture Company in accordance with Section 2.4;

(d) co-operate with the Participant so as to obtain financial incentives from the Authority for the benefit of the Joint Venture Company; and

(e) co-operate with the Participant in carrying out the training programme, referred to in Section 9 of this contract.

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SECTION 6

The Joint Venture Company

6.1 Within three months from the date hereof, the Enterprise and the Participant shall form the Joint Venture Company in accordance with the laws of ____________. The headquarters of the Joint Venture Company shall be located in _____________ and its principal place of business in ______________.

6.2 The name of the Joint Venture Company shall be _____________. The Memorandum and Articles of Association of the Joint Venture Company shall be in such form as the Enterprise and the Participant agree and shall specify:

(a) the number and members and the powers of the Board of Directors; and

(b) the officers of the Joint Venture Company and their powers.

6.3 The capital of the Joint Venture Company shall be such total amount as shall be required to carry out the activities under this contract and shall consist of equity and loan capital in a ratio not to exceed ________.

6.4 The equity shares of the Company shall be allotted [and paid for] as follows:

[Schedule of payments in cash and in kind (tangible and intangible), amounts, currencies and dates for each party.]

6.5 Unless otherwise agreed by the parties, all shares in the Joint Venture Company shall be fully paid and rank pari passu for all purposes.

6.6 The loan capital of the Joint Venture Company shall be obtained as follows:

[Amounts, currencies, sources, general terms, responsibilities of the participants and their liabilities, security, etc., to be specified].

6.7 The Board of Directors of the Joint Venture Company shall not exceed [ ] members and the presence of [ ] members shall be required for a quorum.

6.8 Each party shall appoint such number of members to the Board of Directors as shall be proportionate to its ownership interest to the nearest whole number and may remove and replace any member it has appointed at any time by notice to the other party. The Chairman shall be appointed for a term of two years. The Participant shall appoint the first Chairman from among the directors it has appointed and the Enterprise shall appoint the Chairman for the second term from among the directors it has appointed. Thereafter, the parties shall appoint the Chairman in turn.

6.9 The Joint Venture Company shall not without the written consent of both parties:

(a) amend its Memorandum and Articles of Association;

/...

(b) pass a Special Resolution;

(c) appoint and remove independent auditors;

(d) create, merge, acquire, or consolidate with, any other company;

(e) sell, lease or otherwise dispose of all or a substantial part of its assets;

(f) acquire or maintain any property or assets other than those related to the conduct of its operations;

(g) make any loans save for temporary investment of cash balances and normal staff loans, extend any credits, guarantee any loans or otherwise pledge its credit;

(h) borrow money, other than:

(i) to meet short-term cash requirements in the ordinary course of business;

(ii) to carry out a financial plan approved by both parties;

(i) issue shares or rights to shares;

(j) mortgage, transfer plant and equipment, other than those which are redundant or obsolete, sublet, re-value, hypothecate or otherwise encumber any of its capital assets or interests therein;

(k) renounce any part of the area covered by this contract; or

(l) voluntarily dissolve, liquidate or wind up its affairs, or make an assignment for the benefit of creditors, or petition or apply to any tribunal for the appointment of a trustee or receiver for itself, or commence any proceedings relating to itself under any law relating to bankruptcy, reorganization, arrangement, insolvency or the readjustment of debt, whether now or hereafter in effect.

6.10 All matters before the Board of Directors of the Joint Venture Company shall be decided by majority vote except that the following decisions shall require the approval of not less than ______ of the Directors:

[Specify such decisions, e.g. appointment of the chief executive, approval of the annual budget, work programme, construction programme, procurements above a specified amount, insurance, production schedules, sales contracts, annual financial statements, establishment of and payment into reserves, dividend declarations.]

[Specify method of resolving deadlock.]

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SECTION 7

Ownership of property

7.1 Upon termination of this contract all assets of the Joint Venture Company the costs of which have been fully recovered as Development Costs or Operating Costs in accordance with the Regulations on the Financial Terms of Contracts, shall become the property of the Enterprise without charge.

7.2 Upon termination of the contract the Enterprise shall have the option to purchase any or all of the other assets of the Joint Venture Company at fair market value on an "as is where is" basis. The Enterprise shall have a period of 120 days to exercise its option after which the Participant shall be entitled to transfer and remove within 18 months any property which the Enterprise shall not have exercised its option to purchase. Any property not removed from the area covered by the contract within a period of 24 months from the date of termination, may then be acquired by the Enterprise without charge. The property not so acquired by the Enterprise shall then be removed at the expense of the Joint Venture Company.

SECTION 8

Availability of technology

The Participant shall make available, or arrange for the Joint Venture Company to acquire, the technology necessary to carry out activities under this contract in accordance with a supplementary agreement.

SECTION 9

Training

9.1 The Joint Venture Company shall provide training for staff nominated by the Enterprise at all administrative and technical levels relating to the Joint Venture Company's activities under this contract in accordance with the training programme.

9.2 The training programme shall be submitted by the Board of Directors of the Joint Venture Company for the approval of both parties before the commencement of activities under this contract.

9.3 The Board of Directors of the Joint Venture Company shall submit to both parties, within 90 days after the end of each calendar year, a report indicating the status of each person in the training programme and propose for approval such changes considered necessary or desirable to ensure the successful completion of the training programme by each such person. Upon approval by both parties, the training programme shall be amended accordingly.

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SECTION 10

Procurement of goods and services

In the procurement of goods and services, the Joint Venture Company shall issue invitations to tender and award contracts to bidders offering the best combination of quality, price and delivery time.

SECTION 11

Transactions with affiliates

11.1 Every transaction between the Joint Venture Company and the Participant or an affiliate shall be on the basis of arm's length prices and such other terms and conditions as would have applied in a normal commercial manner in the ordinary course of business had the transaction occurred between unrelated parties or if the parties were not in any special relationship.

11.2 The Participant shall submit to the Enterprise within 60 days after the end of each calendar quarter a report listing each transaction or series of related transactions between the Joint Venture Company and the Participant or an affiliate in an amount equal to or greater than $US [   ] during the reporting period. Each report shall include the name of the parties to the transaction, the date and nature of the transaction and the amount involved. Transactions in an amount less than $US [   ] may be reported in the aggregate.

11.3 At the request of the Enterprise, and at the Joint Venture Company's cost, the Joint Venture Company's independent auditors shall examine the books and records of the Joint Venture Company and the Participant and give the Enterprise an opinion as to the correctness of any such report.

SECTION 12

Books and records

12.1 The Enterprise or the Participant as manager of the Joint Venture Company shall keep books and records of all of the operations of the Company under this contract in the ________ language [one of the languages of the Authority].

12.2 A set of such books and records shall be maintained at ____________.

SECTION 13

Reports

13.1 The Participant or the Enterprise as manager of the Joint Venture Company shall promptly submit to the other party copies of all reports sent to the Authority.

/...

13.2 In addition thereto, the Participant or the Enterprise as manager of the Joint Venture Company shall submit the following reports to the other party at the times indicated:

> [Specify such reports, e.g. monthly management reports, profit and loss statements, balance sheets and cash flow statements, production statements, sales reports.]

13.3 The Enterprise or the Participant as manager of the Joint Venture Company shall also submit such other reports concerning its operations under this contract as the other party may reasonably request.

13.4 All such reports shall be in the language specified in Section 12.1.

SECTION 14

Examination and inspection

14.1 The Enterprise and the Participant and their duly authorized officers, accountants, employees, agents and attorneys shall have the right, at all reasonable times, to examine and make extracts from the books and records of the Joint Venture Company which are required to be kept in accordance with this contract.

14.2 The Enterprise and the Participant and their duly authorized representatives shall have the right, at any reasonable time, to enter upon any of the Joint Venture Company's installations and facilities in the area covered by this contract for the purpose of monitoring its activities for compliance with the terms and conditions of this contract.

14.3 The Enterprise and the Participant as manager of the Joint Venture Company shall assist such representatives in the performance of their duties and provide access to all relevant equipment, facilities and personnel on vessels and installations at all reasonable times.

14.4 Each such representative shall have reasonable access to any of the Joint Venture Company's vessels or installation's records, including its log documentation, and all other recorded data, for purposes of inspection and copying.

14.5 The Joint Venture Company at its expense shall provide each such representative while on board any of its vessels or installations with food, appropriate accommodations and medical facilities, and direct access to all communication equipment and facilities.

14.6 All such representatives shall avoid interference with the safe and normal operations on board vessels and installations used by the Joint Venture Company to carry out activities in the area covered by this contract.

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SECTION 15

Assignment and transfer

The Enterprise and the Participant shall each:

(a) have the right to assign and transfer its obligations as manager of the Company under this contract to a transferee to the same extent that its obligations are transferable under the approved plan of work and the regulations; and

(b) have the right to sell, assign, transfer, convey or otherwise dispose of any of its equity shares in the Joint Venture Company to any third party with the prior consent of the other party, which consent shall not be unreasonably withheld.

SECTION 16

Force majeure

16.1 Neither party shall be liable to the other for an unavoidable delay or failure to perform any obligation under this contract due to an event of force majeure. For purposes of this contract, an event of force majeure shall mean an event or condition which the party could not reasonably be expected to prevent or control; provided that the event or condition was not caused by negligence or by a failure to observe good mining industry practice.

16.2 Each party's duty to perform an obligation affected by such event shall be suspended for a period equal to the delay resulting from the occurrence of such event.

16.3 A party invoking this section shall take all reasonable measures to remove its inability to perform and comply with the terms and conditions of this contract with a minimum of delay; provided that the party shall not be obligated to resolve or terminate any labour dispute except on terms satisfactory to it or pursuant to a final decision of any agency having jurisdiction to resolve the dispute.

16.4 Each party shall give notice to the other party of the occurrence of an event of force majeure as soon as possible, and similarly give notice to the other party of the restoration of normal conditions.

SECTION 17

Termination

17.1 The Enterprise and the Participant may each by notice terminate this contract without prejudice to any other rights that it may have:

(a) if the other party fails to comply with any final award made as a result of arbitration proceedings pursuant to the approved plan of work or this contract;

/...

(b) if the other party is in material breach of any of the provisions of this contract and does not cure such breach within 90 days after notice to do so; or

(c) if the other party or the Joint Venture Company becomes insolvent or commits an act of bankruptcy or is adjudged a bankrupt or enters into any agreement for composition with its creditors or goes into liquidation or receivership, whether compulsory or voluntarily, or petitions or applies to any tribunal for the appointment of a trustee or receiver for itself or commences any proceedings relating to itself under any law relating to bankruptcy, insolvency or the readjustment of debt, whether now or hereafter in effect, other than for the purpose of reconstruction.

17.2 Upon the final termination of this contract for whatever reason and at whatever time, the parties shall have the obligation to comply satisfactorily with the obligations between themselves and with third parties arising under the terms of this contract.

SECTION 18

Waiver

18.1 Failure or delay by any party in the exercise of any right hereunder shall not be considered to be a waiver of such right.

18.2 No waiver of any right hereunder shall be effective as against a party hereto unless such party shall have waived such right in writing, and no such waiver of one right hereunder shall be deemed to be a waiver of any other right not so waived.

SECTION 19

Notice

19.1 All notices, approvals, directions, designations, consents, requests or instructions hereunder shall be made in writing and shall be served by hand, telex, telefax or by pre-paid registered post to the Enterprise or to the Participant at the following addresses:

THE ENTERPRISE:

THE PARTICIPANT:

19.2 Either party may change any such address by not less than ten days' notice to the other party.

19.3 (a) delivery by hand shall be deemed to be effective when made;

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(b) delivery by telex shall be deemed to be effective when the "answer back" appears on the sender's telex machine;

(c) delivery by telefax shall be deemed to be effective when the "transmit confirmation report" confirming the transmission to the receiver's telefax number is received by the transmitter;

(d) delivery by registered post shall be deemed to be effective on the fourteenth day after the day of posting by pre-paid registered post, unless the contrary is proved by the addressee.

19.4 Notice to either party shall constitute effective notice to that party for all purposes under this contract and for the service of process or notification in any proceeding of any court or tribunal having jurisdiction.

SECTION 20

Revision

20.1 When circumstances have arisen or are likely to arise which, in the opinion of the Enterprise or the Participant, would render this contract inequitable or make it impracticable or impossible to carry out the approved plan of work in accordance with the terms and conditions of this contract and the regulations, the parties shall enter into negotiations to revise this contract accordingly.

20.2 Except as otherwise provided herein, this contract may be revised, amended or otherwise changed only with the consent of the Enterprise and the Participant by an appropriate instrument signed by the authorized representatives of the parties.

SECTION 21

Disputes

21.1 Unless otherwise provided in this contract or in the regulations, or the parties otherwise agree, any dispute between the Enterprise and the Participant concerning the interpretation or application of this contract shall be submitted, at the request of either party, to arbitration in accordance with the UNCITRAL Arbitration Rules. Unless the parties otherwise agree, the arbitration shall be held at ___________ and conducted in the language specified in Section 12.1.

21.2 The arbitration tribunal shall have no jurisdiction to decide any question of interpretation of the Convention. When the dispute also involves a question of the interpretation of Part XI and the Annexes relating thereto with respect to activities in the area covered by this contract, that question shall be referred to the Sea-Bed Disputes Chamber for a ruling.

21.3 If at the commencement of or in the course of such arbitration, the arbitration tribunal determines, either at the request of any party to the dispute

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or proprio motu, that its decision depends upon a ruling of the Sea-Bed Disputes Chamber, the arbitral tribunal shall refer such question to the Sea-Bed Disputes Chamber for such ruling. The arbitral tribunal shall then proceed to render its award in conformity with the ruling of the Sea-Bed Disputes Chamber.

SECTION 22

Applicable law

22.1 This contract shall be governed by the terms of this contract, the regulations, Part XI of the Convention and other rules of international law not incompatible with the Convention, and, to the extent not inconsistent therewith, the laws of _______.

22.2 Any final decision rendered by a court or a tribunal having jurisdiction under the Convention relating to the rights and obligations of the Enterprise and of the Participant, shall be enforceable in the territory of each State which has consented to be bound by the Convention and for which the Convention is in force.

SECTION 23

Supplementary documents

Each party undertakes that it will from time to time do all such acts and make, enter into, execute, acknowledge and deliver at the request of the other party such supplementary or additional instruments and documents as may be reasonably required for the purpose of implementing or assuring the rights and obligations of that party under this contract.

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LOS/PCN/SCN.2/WP.18/Add.1
10 August 1990

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEA-BED AUTHORITY AND
FOR THE INTERNATIONAL TRIBUNAL FOR
THE LAW OF THE SEA
Special Commission 2
New York, 13-31 August 1990

DRAFT BASIC JOINT VENTURE CONTRACT

(Working paper by the Secretariat)

Addendum

COMMENTARY ON THE DRAFT BASIC JOINT VENTURE CONTRACT

Preliminary

1. The Enterprise has legal capacity, inter alia, to enter into contracts. See Annex IV, article 13, paragraph 2 (a).

2. Annex III, article 11, paragraphs 2 and 3, uses the terms "contractor" and "partner". The term "Participant" has been used in this model to avoid confusion with the "contractor" in the draft mining code and to include entities which may not be contractors. The term "partner" was not used in order to avoid any confusion between the joint venture and a partnership which could have adverse consequences with respect to liability and taxation.

3. The model assumes that the Participant will be a single entity. It could be a State, a State enterprise, an individual, partnership, corporation, or any other entity, any number of such entities, or any combination thereof, jointly or severally. If more than two entities were parties to the contract, the model would have to be adjusted accordingly.

Section 1. Definitions

4. The definition of "affiliate" is a standard definition used in commercial agreements.

Section 2. Scope

5. Section 2.1 identifies the nature of the contract, and Section 2.2 provides that the joint venture is for exploration or exploitation or for both. The model provides flexibility for the parties to agree on the precise nature and extent of the activities they wish to undertake under the contract.

6. Under Section 2.3, the Joint Venture Company itself, after its formation, shall apply for approval of a plan of work and enter into the contract with the Authority. In the alternative, where a contract for a plan of work has already been issued to the Participant, the contract for a plan of work would be assigned to the Joint Venture Company.

7. It should be noted that while the Enterprise is required to submit plans of work for a reserved area by article 153, paragraph 3, article 162, paragraph 2 (k) and article 170 of the Convention and Annex IV, article 12, paragraph 1, the Enterprise is specifically exempted from the requirement in Annex III, article 3, paragraph 5, that every plan of work be in the form of a contract. However, if the Enterprise's plan of work was approved before the joint venture contract, this would probably have to be confirmed by some kind of legal instrument, which could be assigned, if for no other reason than lenders would insist on confirmation of the legal right to recover the polymetallic nodules as a condition for providing financing.

8. It is common in mining joint ventures for one of the participants to act as manager, usually the participant with the most relevant experience and with the requisite technology. Section 2.4 covers the management of the joint venture and provides that the Participant shall be the initial manager of the Joint Venture Company and that the Enterprise will become the manager at a specified date that could be fixed or after a specific event occurs, such as the recovery of the Participant's investment or the investment plus a specified return. The underlying assumption is that this will encourage the Participant to transfer technology to the Enterprise and train its personnel so as to ensure that the Enterprise will be an effective and efficient manager while the Participant still has an equity interest in the joint venture. This is an alternative to the obvious solution of providing that the Participant shall be the manager of the Joint Venture Company throughout the term of the contract. In any event, the Joint Venture Company must operate in accordance with the sound commercial principles required of the Enterprise by Annex IV, article 1, paragraph 3.

Section 3. Term

9. Section 3 provides that the term of the contract is co-extensive with the duration of the contract for the plan of work.

Section 4. Responsibilities of the Participant

10. Section 4 (a) covers the Participant's responsibilities as manager as provided in Section 2.4.

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11. Section 4 (b) requires that the Participant co-operate with the Enterprise after the Enterprise becomes manager. This parallels Section 5 (b) which requires the Enterprise to co-operate with the Participant when it is the manager.

Section 5. Responsibilities of the Enterprise

12. Section 5 (a) requires the Enterprise to furnish to the Joint Venture Company all relevant information held by it and by the Authority. This could be a very useful provision to a Participant.

13. Sections 5 (b) and (c) cover the responsibilities of the Enterprise and are meant to parallel Section 4 (a) and (b).

14. Section 5 (d) requires the Enterprise to co-operate with the Participant to obtain financial incentives for the benefit of the Joint Venture Company. These financial incentives are listed in articles 88 and 89 of the draft regulations in LOS/PCN/SCN.3/WP.6/Add.2/Rev.1 pursuant to Annex III, article 13, paragraph 1 (d).

15. Section 5 (e) cross-references the training programme in Section 9.

Section 6. The Joint Venture Company

16. Section 6.1 covers the formation, or incorporation, of the Joint Venture Company. However, it may be that a Participant or the Enterprise might find a contractual, or unincorporated, joint venture a preferable arrangement. Should that be the case, then the relevant detailed provisions usually found in the company law of the jurisdiction in which the Joint Venture Company is formed would have to be spelt out in the contract, such as powers of directors, notices of meetings, minutes, etc.

17. The parties have to agree on the country where the joint venture is to be incorporated, where the Joint Venture Company's headquarters is established and the country in which its principal place of business is located. Depending on the law of the country of incorporation, it may be permitted to have its headquarters and its principal place of business in different countries. This would be a function of a number of factors, including the substantive provisions of a country's company law, the procedural requirements and, probably the most significant, the tax and other financial consequences. It should be expected that these elements would play a significant part in the bargaining between the parties and affect the other elements in the joint venture arrangement.

18. The name of the Joint Venture Company has been left open in Section 6.2. A draft of the Memorandum and Articles of Association has not been included because it would be difficult, if not impossible, to predict how the parties will agree on such matters as the equity sharing, the capital structure, the modalities for distributing profits, how risks and liabilities are to be shared and the basic decisions made, the composition of the Board of Directors and the voting requirements, and the number and kinds of officials of the Joint Venture Company and the extent of their authority. These are matters which could only be agreed when the parties have sufficient information concerning the business and financial

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arrangements between them to make drafting a meaningful exercise. At the current stage there are just too many combinations and permutations. The maximum flexibility should be permitted for the parties to establish the joint venture in accordance with "sound commercial principles".

19. Similarly, the amount of the total capital required cannot be known at the current stage. However, Section 6.3 makes it clear that the total amount of capital must be sufficient to carry out the activities required by the plan of work. A limit on the debt-equity ratio is provided because the Authority must approve that ratio as reasonable, having regard to existing commercial practice, under Annex III, article 13, paragraph 6 (o).

20. How the parties agree to share the equity of the Joint Venture Company has been left completely open in Section 6.4; that will be a major element in negotiating the joint venture agreement.

21. The extent to which equity shares will be issued to one party or the other, when and how such shares are paid for, whether in cash (and in what currencies) or in kind, including both tangible contributions (plant, facilities and equipment) and intangibles (technology and, possibly, the assignment of an already approved plan of work or in recognition of financial incentives), will be matters for negotiation at the time. It would be difficult from the current perspective to presume that the parties would agree on a 50/50 equity sharing or any other sharing (or whether any such sharing shall remain fixed or be changed over time). Such a decision is complicated by the fact that the sharing of profits, risks and liabilities and decision-making need not necessarily be proportionate to equity ownership. Each of these facets of the relationship between the parties will be subject to negotiation at the time of the agreement and the proportions could be different for each of them. It is possible, for example, that one party would be more interested in limiting its risks and liabilities than the other and would, therefore, be willing to lower its proportionate decision-making power to obtain that benefit. Again, there are too many combinations and permutations for a pro forma approach to be useful in the present draft, but this flexibility will probably be one of the most attractive features of the joint venture arrangement.

22. However, Section 6.5 does provide for pari passu treatment of the shares for all purposes (i.e., equal treatment, without preference) as a starting point, but the parties could still agree on preferential and differential treatment for a variety of purposes, as suggested above.

23. Section 6.6 leaves completely open the terms and conditions for obtaining the loan capital for the joint venture. Again, they are impossible to predict at the current stage. The joint venture contract would of necessity have to be quite detailed in this regard with respect to the amounts of the loans, the currencies, their sources, repayment obligations, interest rates, guarantees and other responsibilities of the parties, the security to be given, etc. These matters are listed by way of illustration in the text.

24. It is important to stress again that the guarantees or other responsibilities of the parties need not be proportionate to their equity ownership in the Joint Venture Company. It may be, for example, that the Enterprise may not wish to issue

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any guarantees or otherwise accept any financial responsibility for the loan capital of the Joint Venture Company by reason of its shareholding in the Joint Venture Company and, therefore, may be willing to trade off certain benefits to the Participant in negotiating the joint venture contract, such as earlier cash flow participation, in exchange for this protection against risk for the loan capital. The avoidance of such liabilities could be a principal reason for the Enterprise to enter into a joint venture arrangement.

25. The number of seats on the Board of Directors of the Joint Venture Company has been left open in Section 6.7, as is the quorum requirement, to allow for flexibility in the negotiation of the decision-sharing arrangements.

26. While the draft provides in Section 6.8 that the appointment of the members of the Board of Directors of the Joint Venture Company is proportionate to the ownership interest of each party (to the nearest whole number if fractions are involved), it is not uncommon to provide for disproportionate representation, particularly at the early stages of a joint venture. Again, this will be a subject of the negotiation at the time and a function of the trade-offs in the structure of the Joint Venture Company and the distribution of the profits, risks and decision-making powers between the parties.

27. Provision is made for each party to appoint the chairman for alternate terms as an illustration of one of the possibilities. It could be that the party acting as manager at the time could appoint the chairman, if management is to shift. Alternatively, if one party acts as the manager, the other party may wish to be able to appoint the chairman. There are too many possibilities to be usefully canvassed here.

28. The distribution of the decision-making powers between the parties in Section 6.9 would also be negotiated at the time. For illustrative purposes, some decisions are reserved by the parties in Section 6.9 and others are delegated to the Board of Directors in Section 6.10.

29. Section 6.9 requires the unanimous approval of the parties for certain basic decisions commonly found in joint venture agreements in the mining and petroleum sectors. However, those decisions listed in subparagraphs (g), (h) and (j) are also just as commonly made by a board of directors. Of course, unanimous agreement may not be required, particularly where there are more than two shareholders. Sometimes a "blocking vote" is set at 75 per cent, or some lower figure, in the company law of the jurisdiction in which the Joint Venture Company is incorporated, or by agreement of the parties. However, certain decisions, such as amending the Memorandum and Articles of Association, or the appointment and removal of the independent auditors, almost always require unanimous approval.

30. Section 6.10 establishes the principle that decisions of the Board of Directors may be made only by majority vote. But again, for illustrative purposes, provision is made for the possibility of a "blocking vote" in that regard as well for certain critical decisions, especially if there are more than two parties to the joint venture agreement.

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31. A method of resolving any deadlock must be included if the decision-making structure established in the Contract permits such an event.

Section 7. Ownership of property

32. At the end of the Contract, Section 7.1 provides that all of the assets which have been fully recovered in accordance with the Regulations on the Financial Terms of Contracts for purposes of the calculation of the share of net proceeds payable to the Authority shall become the property of the Enterprise without cost. The concept here is that the Authority has in effect paid for such assets through deductions in the calculation of the net proceeds. This provision is common in mining and petroleum agreements. Section 7.2 gives the Enterprise an option to buy any or all other assets at fair market value, a common provision in the mining sector.

33. The underlying assumption in both sections is that the assets may have value to the Enterprise because they could be used in its other operations. In any event, any residual value is just another element to be negotiated between the parties in the joint venture arrangement.

Section 8. Availability of technology

34. The acquisition of technology by the Enterprise is covered by Section 8, a general clause which refers only to the technology necessary to carry out the activities required by the contract. Technology agreements are ordinarily so complicated that they are usually separate from a joint venture contract itself. The details necessary for such an agreement will probably only be known at the time.

Section 9. Training

35. The general provision to provide training for personnel nominated by the Enterprise is contained in Section 9.1. At the current stage it does not seem useful to try to fix the number of personnel to be trained or to develop a formula in that regard. The methodology and content of the programme, the supervisory and expenditure requirements and the like have been left to be negotiated by the parties. The training of staff will be a significant benefit to the Enterprise in entering into the joint venture arrangement.

36. An additional factor which must be taken into account is the extent to which employees of the Participant as manager will provide services directly or on secondment, and the extent to which the Joint Venture Company will have its own employees.

37. Section 9.2 leaves the details of the training programme to be proposed by the Board of Directors of the Joint Venture Company and approved by the parties before each type of activity covered by the Contract commences.

38. Monitoring provisions are contained in Section 9.3 which also provides flexibility so that the programme can be modified from time to time as necessary in the course of carrying out operations and as experience is gained.

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Section 10. Procurement of goods and services

39. This section is based on the same commercial principles as those upon which the Joint Venture Company is to operate. See Annex IV, article 12, paragraph 3.

40. Reference is made to Section 6.10 where the Board of Directors may be given the power to approve procurements above a specified amount.

Section 11. Transactions with affiliates

41. "Affiliate" is a defined term in Section 1.1. The assurance of arm's length prices and other terms and conditions is required under Annex III, article 13, paragraph 9 (a).

42. Section 11.2 establishes reporting requirements as a means of monitoring. Some mining and petroleum agreements have included additional provisions requiring that affiliated transaction reports be certified by an officer of the Participant. Some agreements also require that the Participant notify the other parties to a joint venture in advance of any proposed transaction, or series of related transactions, between the Participant and an affiliate which exceeds a specified (usually comparatively very high) amount. This gives the other party the opportunity to request such details as may be necessary to ensure that such transactions are carried out on an arm's length basis. It is usually found necessary that such provisions contain deadlines so that if any request for information is not made, or objection to the transaction not given, within a specified number of days of the notice, the proposed transaction may proceed without such prior approval.

Section 12. Books and records

43. This section requires that the books and records be kept in the agreed-upon language (which must be one of the languages of the Authority) and that they be located at a specified place in order to facilitate monitoring by the Enterprise or the Participant as the case may be, depending upon which party is acting as manager of the Joint Venture Company.

Section 13. Reports

44. Section 13.1 provides that the manager of the Joint Venture Company must submit copies of all reports sent to the Authority to the other party, so that both parties are kept equally informed. This assumes that the Enterprise will have a staff and files separate from the Authority.

45. Provision is made in Section 13.2 for specific reports which must be sent to each party. Reports usually covered by joint venture agreements in the mining and petroleum sector are referred to in Section 13.2 by way of illustration. The financial and technical advisers to the parties may wish to obtain additional reports, and this will be the subject of negotiation.

46. Section 13.3 is a catch-all provision for any additional reports that either party may reasonably request in the future.

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Section 14. Examination and inspection

47. Sections 14.1 and 14.2 contain provisions for examination and inspection which are commonly found in joint venture agreements. However, because of the offshore nature of the joint venture operations, it was thought useful to include provisions addressing the special problems of vessels and offshore installations in Sections 14.3-14.6. They parallel the provisions for inspectors, article 116, of the draft Regulations on Prospecting, Exploration and Exploitation of Polymetallic Nodules in the Area - Part VIII, Protection and Preservation of the Marine Environment from Activities in the Area (LOS/PCN/SCN.3/WP.6/Add.5).

Section 15. Assignment and transfer

48. Subparagraph (a) of Section 15 links the assignment and transfer provisions of the joint venture contract to that of the contract for the plan of work.

49. Subparagraph (b) provides that no sale of the shares in the Joint Venture Company may be made by one party without the consent of the other. This limitation is qualified by the common provision that such consent shall not be unreasonably withheld. There are, of course, other methods of dealing with this matter; the most common is to provide for a right of first refusal for a limited period of time, which may be in lieu of, or in addition to, the consent provision.

Section 16. Force majeure

50. This force majeure provision is the usual provision found in mining and petroleum agreements.

Section 17. Termination

51. The termination provision in Section 17.1 is not as stringent as that required by Annex III, article 18, paragraph 1 (a) which governs the suspension or the termination of a Participant's rights under contracts for plans of work. Subparagraph (b) provides for termination in the event either party is "in material breach" of the joint venture agreement rather than any "serious, persistent and wilful violations of the fundamental terms of the contract ..." A distinction must be drawn between the loss of the right to carry out the mining operations and a breach of an agreement between participants in the Joint Venture Company. "Material" has a well-defined legal meaning in a large number of legal systems.

52. Paragraph 17.1 (c) provides that either party may terminate the joint venture contract if the other becomes insolvent or commits an act of bankruptcy, etc., in order to allow the other party to continue to carry on operations without being mired in bankruptcy proceedings which could require the suspension of operations for a considerable period of time.

Section 18. Waiver

53. This is a standard provision usually found in contracts and sometimes referred to as "boiler-plate".

Section 19. Notice

54. This is a standard form of notice provision.

Section 20. Revision

55. Section 20.1 is based on Annex III, article 19, paragraph 1, and Section 20.2 is based on Annex III, article 19, paragraph 2.

Section 21. Disputes

56. Section 21.1 provides for disputes to be settled in accordance with the UNCITRAL Arbitration Rules pursuant to article 188, paragraph 2, of the Convention, with a specified place of arbitration and language to be used in the proceedings. Flexibility is provided by allowing the parties to agree to ad hoc arbitration or to change the place of arbitration. The jurisdiction of the arbitration tribunal is limited with respect to interpretation of the Convention in accordance with article 188, paragraph 2 (a) and (b), of the Convention.

Section 22. Applicable law

57. Section 22.1 is based on Annex III, article 21, paragraph 1. In order to provide for an applicable commercial law to govern the relationships between the parties, they must select the laws of a particular country, which, of course, is likely to be the country in which the Joint Venture Company is registered.

58. Section 22.2 provides for the enforceability of a final decision by a tribunal having jurisdiction in accordance with Annex III, article 21, paragraph 2, and Annex IV, article 13, paragraph 3.

Section 23. Supplementary documents

59. This is the usual provision for a business arrangement which perforce will entail a number of documents. It requires the parties to execute, etc., supplemental instruments and documents reasonably required to implement or assure the rights and obligations of the parties under the Contract. There will undoubtedly be many of them in the various national jurisdictions in which the Joint Venture Company and its manager will carry out activities.

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LOS/PCN/SCN.2/WP.18/Rev.1
14 August 1992

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEABED AUTHORITY AND
FOR THE INTERNATIONAL TRIBUNAL FOR
THE LAW OF THE SEA
Special Commission 2
New York, 10-21 August 1992

DRAFT BASIC JOINT VENTURE CONTRACT WITH RECOMMENDED ANNOTATIONS BY SPECIAL COMMISSION 2

(Working paper by the Secretariat)

INTRODUCTION

1. In its consideration of item (iii) of its programme of work "Development of policies and feasibility studies in preparation for the early entry into effective operation of the Enterprise", Special Commission 2 recognized the need to give priority attention to joint ventures as a method of operation for the Enterprise. It was pointed out that in 1971, when the Latin American Group had introduced a 13-point power draft to deal with the international seabed area, the joint venture option was felt to be the only option for exploration, exploitation and processing of polymetallic nodules from the Area.

2. Throughout its deliberations on operational options, preference was expressed by the Special Commission for the joint venture option as the appropriate contractual device to ensure that the seabed is efficiently exploited. In that regard, a number of statements and working papers were heard and considered by the Special Commission. During the second session (1984), a preliminary note, "Preparatory work in relation to the Enteprise" and a proposal, "Austrian proposal before the Preparatory Commission for the International Seabed Authority" submitted by the Asian-African Legal Consultative Committee were circulated to the Special Commission. During the second session, the delegation of Austria had submitted a proposal to establish a Joint Enterprise for Exploration, Research and Development in Ocean Mining (JEFERAD) in the following documents: LOS/PCN/SCN.2/L.2, "Austria: Proposal for a Joint Enterprise for Exploration, Research and Development in Ocean Mining (JEFERAD)"; LOS/PCN/SCN.2/L.2/Add.1, "Addendum. Austria: Proposal for a Joint Enterprise for Exploration, Research and Development in Ocean Mining (JEFERAD)". Additional explanatory notes as conveyed to the Special Commission for the Enterprise in the statement of the delegation of Austria on 23 March 1984 and LOS/PCN/SCN.2/L.2/Rev.1, "Austria: Proposal for a Joint Enterprise for Exploration, Research and Development in Ocean Mining (JEFERAD)".

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3. LOS/PCN/SCN.2/WP.3, "Information note on elements of joint ventures" was requested by the Special Commission and considered by it during the resumed second session (1984, Geneva). This working paper outlined considerations relevant to the conclusion of joint venture agreements. LOS/PCN/SCN.2/WP.4, "Proposal on a joint venture - Proposals by the delegations of Belgium, France, Germany, Federal Republic of, Italy, Japan, the Netherlands and the United Kingdom of Great Britain and Northern Ireland" as also presented at the resumed second session. This working paper, while recognizing that no hard and fast criteria can be established for a successful joint venture agreement, noted the importance of allowing the Governing Board of the Enterprise suyfficient flexibility when negotiating with prospective partners. It discussed some of the key elements for establishing a successful joint venture agreement based on a model agreement contained in document LOS/PCN/SCN.2/WP.5, "A model joint venture agreement for seabed mining - submitted by the delegation of the Federal Republic of Germany.

4. LOS/PCN/SCN.2/WP.5 contained a model agreement for establishing a joint venture between the Enterprise and national or transnational, private or State-owned compaies or consortia. The model agreement was not meant to tie discussions down to the specific clauses contained therein, but rather to identify the issues that would have to be addressed and equitably solved if a mutually beneficial joint venture relationship was to be concluded between the concerned parties. At the request of the Special Commission, during the fifth session (1987, Kingston), the delegation of Colombia submitted document LOS/PCN/SCN.2/WP.4, "The International Venture." This study provided a further analysis of a joint venture between pioneer investors and the Enterprise, placing special emphasis on exploration, research and development, and the training of personnel.

5. At the resumed eighth session (1990, New York), Special Commission 2 began consideration of document LOS/PCN/SCN.2/WP.18, "Draft basic joint venture contract" and document LOS/PCN:SCN.2/WP.18/Add.1, "Draft basic joint venture contract - Explanatory memorandum" which were prepared by the secretariat to facilitate concrete discussions on joint ventures. In introducing the working papers, the Special Representative of the Secretary-General recalled that during the meetings of the Seabed Committee and the Third Conference on the Law of the Sea, considerable importance had been given to the idea of a joint venture as the sole mechanism for the development of the resources of the seabed. He noted that in response to the request by the Special Commission, the secretariat had assembled information on joint ventures in the petroleum, mining and other industries to produce the single model contained in LOS.PCN/SCN.2/WP.18. He pointed out that the model did not contain all the details which were needed for a joint venture arrangement.

6. In conducting its work, the Special Commission decided to undertake a section-by-section reading of the two documents, which helped to focus attention on the joint venture option without detracting from other operational options. It decided further to provide annotations, as appropriate, both to the sections contained in LOS/PCN/CN.2/WP.18 and to the explanatory memorandum.

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General Comments

7. With regard to the explanatory memorandum in the working paper, the view was expressed that a decision with respect to the joint venture option would depend on how the following points were addressed:

(i) The form the joint venture would take, that is, contractual or incorporated;

(ii) The ratio of capital participation of the joint venture partners. In the case of the Enterprise, it was noted that this would depend on the rate of contributions of countries that had ratified the Convention;

(iii) The need to ensure that the decision-making mechanism within the joint venture recognized the Enterprise's right to have a say in its affairs;

(iv) Transfer of technology (section 8 of the working paper);

(v) Training (section 9);

(vi) The manner in which conflicts would be resolved between the partners (section 21).

8. With regard to the type of joint venture arrangement used as a model in the working paper, i.e., the incorporated rather than the contractual, questions were raised as to why the former model had been chosen when the explanatory memorandum had indicated the advantages of the contractral joint venture. It was noted that the basic intentions of the two parties would be reflected in the provisions of either the contractual or the incorporated joint venture and that the difference would be in the modality of implementation.

9. It was pointed out that by concentrating the discussion on joint ventures on annotations to LOS/PCN/SCN.2/WP.18, which is a model contract for an incorporated joint venture, it did not provide the Special Commission with an opportunity to discuss the contents of a contractual joint venture model for which general preference had been expressed. The advantages of the contractual joint venture are clearly highlighted in LOS/PCN/SCN.2/WP.18, in particular its paragraphs 15, 16 and 19.

10. The basic principles of Annex III, article 11 of the Convention which envisages joint ventures between the contractor and the Authority were recalled, as was the fact that contractual arrangements can only be entered into by entities sponsored by a party to the Convention. It was emphasized that research and development was an essential component of high technology ventures such as seabed mining and that the need for research and development could not be overstated during the early phases of the work of the Enterprise when exploration may not take place.

11. The Group of Six in a general statement on the subject of joint ventures reaffirmed the statement which the Group had made at the resumed eighth session in New York. It was stated that the Group shared the general acceptance of the joint venture option as the preferred option for the Enterprise in its initial operations. The Group was of the opinion that this option offered a lot of advantages and that it may contribute to solving problems raised by some of the provisions of the Convention and its annexes. The Group had taken account of the fact that the provisions of joint venture agreements depend on the particular characteristics of the project and the objectives of each of the participants, as paragraph 11 of working paper 18 indicates. It had therefore decided that it was premature to decide on any clauses of a future joint venture agreement. At this stage, the Group was of the opinion that the model agreement could only serve illustrative purposes, as it was rightly stated in paragraph 8 of working paper 18. The Group of Six stressed that the model joint venture contract contained in documents WP.18 and Add.1 as well as the proposals presented in documents LOS/PCN/SCN.2/WP.4 and WP.5 could serve only as a source for partners in the joint venture when they devise a draft for such an agreement.

EXPLANATORY MEMORANDUM

12. Joint venture arrangements as a method of operation for the Enterprise have been the subject of consideration by the Preparatory Commission at various times since 1983. Indeed, they were the subject-matter of extensive discussions during the Conference itself and were for a long time considered to be the norm for the operations of the Enterprise.

13. Annex III, article 11, paragraph 1, of the Convention, specifically states that:

> "Contracts may provide for joint arrangements between the contractor and the Authority through the Enterprise, in the form of joint ventures or production sharing, as well as any other form of joint arrangement ..."

14. Already at the resumed second session of the Preparatory Commission the Secretariat had submitted a background paper, "Information note on elements of joint ventures" (LOS/PCN/SCN.2/WP.3), in response to a request made by the Special Commission.*

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* See also the preliminary note submitted by the secretariat of the Asian-African Legal Consultative Committee (AALCC) of 6 February 1984 and the introduction to the Model Joint Venture Agreement for Sea-Bed Mining submitted by the Federal Republic of Germany (LOS/PCN/SCN.2/WP.5).

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15. The Special Commission has looked at various operational options for the Enterprise, and in the course of those discussions it was suggested that the initial operations of the Enterprise should be through a joint venture arrangement. Indeed, the Chairman of Special Commission 2 reported to the plenary at the end of the resumed third session, on 4 September 1985, that:

> "... it is to be noted that many delegations continue to believe that a joint venture may be the most likely option for the first project of the Enterprise, from the point of view of practicality and minimization of risks. The advantages of a joint venture for both mining and processing have been stressed particularly as regards transfer of technology and development of manpower. Furthermore, some delegations have suggested that when the Special Commission takes up the question of joint ventures in detail, both equity and contractual joint ventures should be studied." (LOS/PCN/L.25, para. 16)

16. At the resumed fourth session, on 5 September 1986, the Chairman, reporting on the work of Special Commission 2, stated:

> "In the same vein, delegations have suggested that the Special Commission should restrict the scope of its recommendations on operational options, confining itself, unless conditions change, to those options that would better facilitate the start-up of operations. Particular mention has been made of the joint venture and leasing options in that context." (LOS/PCN/L.40, para. 4)

17. Furthermore, at the end of the sixth session, on 8 April 1988, the Chairman of Special Commission 2 reported that:

> "... the Special Commission predicts that it will be possible, even during the interim period, to narrow down the likely range of options that the Enterprise would consider. In this event, the work of the Special Commission would be adjusted to take this into account. Special mention was made of joint ventures and of their complexities, which would indicate the need to allow sufficient time to assemble the necessary information and prepare any working papers needed." (LOS/PCN/L.60, para. 15)

18. It is pursuant to that request for a working paper on joint ventures that the Secretariat has prepared the Model Joint Venture Contract presented below.

19. The present working paper briefly discusses the joint venture arrangements by way of an introduction to the Model Joint Venture Contract, which has been prepared for illustrative purposes. A commentary on the provisions is contained in an addendum to the paper.

20. A joint venture is one of several kinds of arrangements from which two or more entities choose the most effective and efficient mode of operations to best meet their objectives and their financial, technical and other circumstances. The joint venture arrangement differs from others in that it is a commercial relationship organized in order to carry out a particular project or venture over a comparatively long duration, which is characterized by its "jointness" or sharing of ownership, profits, risks and decision-making. This distinguishes the joint venture from other forms of commercial arrangements, such as service contracts, technical agreements, turnkey contracts, etc.

21. The joint venture has a flexible structure which allows for a variety of arrangements with regard to ownership, the contributions of the participants and the allocation of profits, risks and decision-making between them, none of which need bear any relationship to any of the others. This would allow a number of disparate participants of different nationalities and themselves having different forms (States, State enterprises, individuals, partnerships, corporations, other forms of enterprises or combinations thereof) to form one commercial entity for a particular venture.

22. It is important to note that the provisions in every joint venture agreement depend on the particular characteristics of the project and the objectives of each of the participants. The number of permutations and commutations in this regard are almost unlimited, but the basic provisions concern ownership, the contributions of the parties in cash and in kind (both tangible and intangible), the sharing of profits and of risks, management decisions and control, and the settlement of disputes. These are central, but a whole host of other matters need to be negotiated. Any model cannot contain all such details and choices.

23. There are two types of joint ventures: the incorporated joint venture and the contractual joint venture. The former involves sharing of ownership through a separate legal entity incorporated for that purpose. It is then a corporation under a particular municipal law and the liabilities of the participants (the equity shareholders) are limited in accordance with that law. That law sets out how the participants will make their contributions and how the profits, risks and decision-making will be shared, subject to modification by the participants within certain parameters. An incorporated joint venture as a legal entity may be subject to taxation, separate from its participants, in accordance with the laws of the country of its incorporation and the countries in which it carries on business.

24. In the contractual joint venture, no separate legal entity is established and the ownership of assets is shared; the rights and obligations of the participants are set out entirely in the contract which establishes the business relationship. As the rights and obligations of the parties are governed solely by what is agreed upon in the contract, it must state how the assets will be acquired and owned and how the participants will share the profits, risks and decision-making. While the participants can allocate liabilities as between themselves, the liabilities with regard to third parties are usually not limited, but are joint and several. However, participants usually try to limit their liabilities in a contractual joint venture by organizing a separate limited liability company, a wholly owned subsidiary, to enter into the joint venture contract and carry out its obligations. The risk is then, subject to certain exceptions, limited to the amount of the paid-in equity capital of that company. The contractual type of joint venture is often used in large construction and other projects for financing purposes where each participant makes its own financing arrangements.

25. Since a separate legal entity is not established, a contractual joint venture as such is not subject to taxation, but each of the participants is subject to taxation in accordance with the law applicable to that participant. For that reason, this kind of arrangement has been used in multinational arrangements in a number of sectors, such as petroleum, mining and construction.

26. Thus a contractual joint venture might offer advantages for the Enterprise (which has certain privileges and immunities under the Convention) as well as for other entities.

27. Joint venture arrangements could be used for reserved and unreserved areas. There are a number of reasons for the parties to form a joint venture. It is likely that a participant might wish to enter into a Joint Venture Contract in order to limit its liabilities to the extent of its share of the joint venture pursuant to Annex III, article 11, paragraph 3. But joint ventures could also be a mechanism to provide financial incentives to contractors by providing them with faster cash flows, thus enabling them to begin sea-bed mining earlier than otherwise. In this respect, the contractual form could be more advantageous than the incorporated form, as cash flows could be more direct and not dependent on the declaration of dividends.

28. The joint venture arrangement could also be used to limit the capital and loan requirements of the Enterprise and to reduce risks and liabilities. In doing so, the Enterprise would also be able to start operations at an earlier time than might otherwise be financially possible.

29. Joint ventures could also provide a mechanism for the Enterprise to obtain technology and to train personnel so as to become operational sooner than might otherwise be the case.

30. The model contract which follows has been prepared for an incorporated joint venture, which is still the more usual form, though contractual joint ventures have been increasingly popular in recent years in a number of countries with widely differing economic systems. The model could be readily adapted to a contractual joint venture by including the standard provisions which form part of the rules governing incorporated companies in national laws. Those provisions were not reproduced as they would only add bulk to the model without adding much to the principles of joint venture arrangements at the current stage.

31. The use of the term "Participant" in the model contract is not to be construed as precluding more than one entities in their joint or several capacities entering into joint venture arrangements with the Enterprise.

32. The article-by-article commentary on the various sections of the model contract which is issued as an addendum to the present working paper is designed to assist the Commission in its consideration of the paper.

JOINT VENTURE CONTRACT

BETWEEN

THE ENTERPRISE OF THE INTERNATIONAL SEA-BED AUTHORITY

AND

____
(State or Entity)

THIS CONTRACT, made the _____ day of ________________, between the Enterprise (hereinafter called "the Enterprise") of the International Sea-Bed Authority (hereinafter called "the Authority") and ______________________ (State or Entity), ______________________ (Legal status) (hereinafter called "the Participant");

WHEREAS:

1. The Enterprise is the organ of the Authority which carries out activities in the sea-bed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction;

2. The Enterprise and the Participant have agreed to form a joint venture company to carry out (exploration) (exploitation) (exploration and exploitation) in accordance with the terms and conditions of this contract;

NOW, THEREFORE, the Enterprise and the Participant agree as follows:

Annotation

It was suggested that after each party, the words "represented by" should be added since it was usual practice to add a reference to the person who had signed the Contract. It was also suggested that the definition of the Enterprise in the first preambular paragraph was restrictive when compared to the definition provided in annex IV, article 1. It was stated that since the Enterprise not only operated in the Area but also carried out other functions, there was a need to elaborate on the scope of its activities.

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SECTION 1

Definitions

For the purpose of this contract:

1.1 "affiliate" means any person, firm or company, directly or indirectly controlling, controlled by or under common control with the Participant. For purposes of this definition, "control" means the power to direct management and policies;

1.2 "applicable law" means the law applicable to this contract in accordance with Section 22;

1.3 "approved plan of work" means the contract containing the plan of work referred to in Section 2.3;

1.4 "area covered by this contract" means the sea-bed and ocean floor and subsoil of the area defined by the co-ordinates listed in Annex A;

1.5 "Convention" means the 1982 United Nations Convention on the Law of the Sea;

1.6 "Authority" means the International Sea-Bed Authority established by the Convention;

1.7 "Joint Venture Company" means the joint venture company formed pursuant to Section 6.1;

1.8 "regulations" means the rules, regulations and procedures of the Authority.

Annotation

The view was expressed that if a definition had been given for the Authority then a definition should be given for the Enterprise. In this connection, it was suggested that the preambular paragraph referred to above, should only state what the activity was, and that if a definition was included in section 1, it would need to conform to Annex IV, article 1. Another view was that the Enterprise was a moral person of the contract and as a result did not need to be defined. The view was held that there may be a need to define the Participant. Finally, it was stated that it was usual practice to describe the contracting parties and not to define them. It appears, however, to be generally accepted that a definition is not necessary as long as the contracting parties are described within the contract.

The definition of applicable law in this section and provisions regarding it as contained in section 22 of the model contract resulted in considerable discussions. It was suggested that it would be necessary to delink section 1.2 from section 22 so that applicable law is defined as the law to be applied to the contract. It was also agreed to separate sections 22.1 and 22.2 since the former dealt with the applicable law which would govern the contract and the latter with enforcement of the law. Concern was expressed with section 22.2 and the inability of the Enterprise to enforce a decision against a partner who is not a Party to the Convention. It was noted that since there cannot be a contract unless the entity, whether public of private, is sponsored by a Party to the Convention, the legal provisions in article 21 (1) of Annex III must be built into the contract between

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the parties. It was also pointed out that it was necessary to distinguish between the substantive and procedural laws of the country of the contract, and that the applicable substantive laws are those to be applied and implemented when decisions need to be enforced.

SECTION 2

Scope

2.1 This contract is a Joint Venture Contract.

2.2 The Enterprise and the Participant shall form the Joint Venture Company to carry out (exploration) (exploitation) (exploration and exploitation) of polymetallic nodules from the area covered by this contract in accordance with sound market principles.

2.3 The Joint Venture Company shall apply to the Authority for approval of a plan of work for (exploration) (exploitation) (exploration and exploitation) in accordance with the regulations. Upon approval by the Council of the Authority, the Joint Venture Company shall enter into a contract with the Authority for the plan of work for (exploration) (exploitation) (exploration and exploitation) for the area covered by this contract. In the event that the Participant has already obtained the contract, the contract shall be assigned to the Joint Venture Company in accordance with the regulations.

2.4 The Participant shall be the manager of the Joint Venture Company from the date of its formation until ________ and shall be responsible for the Joint Venture Company's carrying out activities under this contract with efficiency and economy in accordance with sound commercial principles and in compliance with applicable law and the terms and conditions of this contract, the approved plan of work and the regulations. Thereafter the Enterprise shall be the manager of the Joint Venture Company and shall have such responsibility.

Annotation

With regard to section 2, Scope, it was held that there was a gap in section 2.2. This arose because the working paper addressed itself solely to the assets of the joint venture and did not consider the issue of intellectual property and the ownership of patents which are involved in the transfer of technology in such a high technology joint venture. It was noted that an essential component of any high technology joint venture is Research and Development, and if the Enterprise were to be competitive in the marketplace, then additional attention should be directed to this matter in the model contract.

With regard to section 2.4, it was pointed out that this did not constitute usual practice. Usually, the company is managed by the party which holds at least 51 percent of the shares of the company. Another view was that since the choice of the manager was dependent on the level of competence, sometimes the minor participant could be the manager. The view was expressed that the wording of section 2.4 might make the switch, for the Enterprise to become the manager mandatory. It was suggested further that the provision be reworded to allow for this flexibility. It was also noted that the provision should provide for the possibility of a third party becoming the manager of the company.

SECTION 3

Term

Subject to Section 17, the term of this contract shall begin on the date hereof and end upon the expiration or termination of the approved plan of work.

Annotation

The view was expressed that the language of the section could be made clearer. It was pointed out that in the French text the contract would be in effect from the date of its conclusion, while usual practice was to state that the contract would enter into force on the date of signature. It was suggested that the article needed to stipulate that the contract would be terminated in the event of unusual circumstances such as bankruptcy. Another view was that this concern was covered by the provisions of section 17 (c) which deals with unusual circumstances.

SECTION 4

Responsibilities of the Participant

The Participant shall:

(a) carry out the activities under this contract as manager of the Joint Venture Company in accordance with Section 2.4;

(b) thereafter, co-operate with the Enterprise so as to facilitate its performance as the manager of the Joint Venture Company.

Annotation

It was suggested that the list of the Participant's responsibilities was not exhaustive and that the Participant needed to present reports on production and other activities, and to report to the Board of Directors. In this regard, it was noted that while in section 5 (e), provision is made for the Enterprise to cooperate with the Participant in carrying out the training programme, there is no corresponding provision in section 4, obliging the Participant to train people for the Enterprise. Similarly, it has been noted that while the obligation of the Participant to transfer technology is provided for in section 8, that obligation is not reflected in this section.

Another view was that it was not necessary to add these obligations to section 4. A number of drafting proposals were made. It was suggested that section (a) be redrafted to read as follows:

> "Until the Enterprise assumes such responsibility the Participant shall carry out activities under this contract as manager of the Joint Venture Company in accordance with section 2.4", and that section 4 (b) be redrafted as follows:
>
> "The Participant shall thereafter, cooperate with the Enterprise so as to facilitate performance by the Enterprise of its responsibilities as the manager of the Joint Venture Company."
>
> It was also suggested that a new section 4 (c) be added to read:
>
> "The Participant shall provide training for the Enterprise."

SECTION 5

Responsibilities of the Enterprise

The Enterprise shall:

(a) furnish to the Joint Venture Company all relevant information held by it or by the Authority relating to the area covered by this contract;

(b) co-operate with the Participant so as to facilitate its performance as the manager of the Joint Venture Company until the date specified in Section 2.3;

(c) thereafter carry out the activities under this contract as manager of the Joint Venture Company in accordance with Section 2.4;

(d) co-operate with the Participant so as to obtain financial incentives from the Authority for the benefit of the Joint Venture Company; and

(e) co-operate with the Participant in carrying out the training programme, referred to in Section 9 of this contract.

SECTION 6

The Joint Venture Company

6.1 Within three months from the date hereof, the Enterprise and the Participant shall form the Joint Venture Company in accordance with the laws of ___________. The headquarters of the Joint Venture Company shall be located in ____________ and its principal place of business in _____________.

6.2 The name of the Joint Venture Company shall be _____________. The Memorandum and Articles of Association of the Joint Venture Company shall be in such form as the Enterprise and the Participant agree and shall specify:

(a) the number and members and the powers of the Board of Directors; and

(b) the officers of the Joint Venture Company and their powers.

6.3 The capital of the Joint Venture Company shall be such total amount as shall be required to carry out the activities under this contract and shall consist of equity and loan capital in a ratio not to exceed ________.

6.4 The equity shares of the Company shall be allotted [and paid for] as follows:

[Schedule of payments in cash and in kind (tangible and intangible), amounts, currencies and dates for each party.]

6.5 Unless otherwise agreed by the parties, all shares in the Joint Venture Company shall be fully paid and rank pari passu for all purposes.

6.6 The loan capital of the Joint Venture Company shall be obtained as follows:

[Amounts, currencies, sources, general terms, responsibilities of the participants and their liabilities, security, etc., to be specified].

6.7 The Board of Directors of the Joint Venture Company shall not exceed [ ] members and the presence of [ ] members shall be required for a quorum.

6.8 Each party shall appoint such number of members to the Board of Directors as shall be proportionate to its ownership interest to the nearest whole number and may remove and replace any member it has appointed at any time by notice to the other party. The Chairman shall be appointed for a term of two years. The Participant shall appoint the first Chairman from among the directors it has appointed and the Enterprise shall appoint the Chairman for the second term from among the directors it has appointed. Thereafter, the parties shall appoint the Chairman in turn.

6.9 The Joint Venture Company shall not without the written consent of both parties:

(a) amend its Memorandum and Articles of Association;

(b) pass a Special Resolution;

(c) appoint and remove independent auditors;

(d) create, merge, acquire, or consolidate with, any other company;

(e) sell, lease or otherwise dispose of all or a substantial part of its assets;

(f) acquire or maintain any property or assets other than those related to the conduct of its operations;

(g) make any loans save for temporary investment of cash balances and normal staff loans, extend any credits, guarantee any loans or otherwise pledge its credit;

(h) borrow money, other than:

(i) to meet short-term cash requirements in the ordinary course of business;

(ii) to carry out a financial plan approved by both parties;

(i) issue shares or rights to shares;

(j) mortgage, transfer plant and equipment, other than those which are redundant or obsolete, sublet, re-value, hypothecate or otherwise encumber any of its capital assets or interests therein;

(k) renounce any part of the area covered by this contract; or

(l) voluntarily dissolve, liquidate or wind up its affairs, or make an assignment for the benefit of creditors, or petition or apply to any tribunal for the appointment of a trustee or receiver for itself, or commence any proceedings relating to itself under any law relating to bankruptcy, reorganization, arrangement, insolvency or the readjustment of debt, whether now or hereafter in effect.

6.10 All matters before the Board of Directors of the Joint Venture Company shall be decided by majority vote except that the following decisions shall require the approval of not less than _____ of the Directors:

/...

[Specify such decisions, e.g. appointment of the chief executive, approval of the annual budget, work programme, construction programme, procurements above a specified amount, insurance, production schedules, sales contracts, annual financial statements, establishment of and payment into reserves, dividend declarations.]

[Specify method of resolving deadlock.]

Annotation

A number of views were expressed. In section 6.1 the view was put forward that the term "headquarters" in different legal systems could be interpreted in a number of ways. It was suggested that the provision be amended to read siège sociale and headquarters. It was pointed out that in English commercial law, the term "headquarters" is the principal place of business of the company. Regarding section 6.2, the view was expressed that it was necessary to elucidate all the details on the Articles of Association and the Memorandum of the Joint Venture Company. The need to specify the currency in which the capital of the Joint Venture Company would be paid was indicated in section 6.3. It was pointed out that since the Joint Venture could be for exploration and/or exploitation and that while the capital input of the two parties might be the same in the beginning, it would be different once exploitation commenced, because the Enterprise's equity would be an explored site. It was also suggested that since WP.18 was only a model contract, this type of specificity was not required.

Misgivings were expressed in relation to section 6.6. The point was made that the provision could result in the party providing the loan, mortgaging the collective loan capital of the company and thus hampering its work. It was stated in this connection that since the loan would have to be secured, a mortgage problem would indeed arise.

Regarding section 6.7, it was suggested that it would be necessary to specify the minimum number of the members of the Board of Directors and the number that constituted a quorum. The point was made that the section needed to specify how a decision would be taken if the number of votes on either side of an issue were equal, and whether or not the chairman of the Board of Directors would have a casting vote.

Regarding section 6.9, it was stated that section 6.9 (b) was ambiguous and that it should either be deleted or it should specify what activities were prohibited. In relation to section 6.10, it was felt that the majority required for substantive issues should be more than a simple majority and that it should be left to the parties to decide on the actual percentages.

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SECTION 7

Ownership of property

7.1 Upon termination of this contract all assets of the Joint Venture Company the costs of which have been fully recovered as Development Costs or Operating Costs in accordance with the Regulations on the Financial Terms of Contracts, shall become the property of the Enterprise without charge.

7.2 Upon termination of the contract the Enterprise shall have the option to purchase any or all of the other assets of the Joint Venture Company at fair market value on an "as is where is" basis. The Enterprise shall have a period of 120 days to exercise its option after which the Participant shall be entitled to transfer and remove within 18 months any property which the Enterprise shall not have exercised its option to purchase. Any property not removed from the area covered by the contract within a period of 24 months from the date of termination, may then be acquired by the Enterprise without charge. The property not so acquired by the Enterprise shall then be removed at the expense of the Joint Venture Company.

Annotation

The view was expressed that it is usual practice for the assets of the company to be divided according to the number of shares held by each party. This view held that upon termination of the contract, debts would first be recovered and the remainder of the assets shared in proportion to the shareholding. Another view was that since the assets would have been fully recovered as Development or Operating costs, these assets became the property of the Enterprise.

SECTION 8

Availability of technology

The Participant shall make available, or arrange for the Joint Venture Company to acquire, the technology necessary to carry out activities under this contract in accordance with a supplementary agreement.

Annotation

The view was expressed that upon termination of the contract, the technology should be transferred to the Joint Venture Company.

SECTION 9

Training

9.1 The Joint Venture Company shall provide training for staff nominated by the Enterprise at all administrative and technical levels relating to the Joint Venture Company's activities under this contract in accordance with the training programme.

9.2 The training programme shall be submitted by the Board of Directors of the Joint Venture Company for the approval of both parties before the commencement of activities under this contract.

/...

9.3 The Board of Directors of the Joint Venture Company shall submit to both parties, within 90 days after the end of each calendar year, a report indicating the status of each person in the training programme and propose for approval such changes considered necessary or desirable to ensure the successful completion of the training programme by each such person. Upon approval by both parties, the training programme shall be amended accordingly.

Annotation

It was stated that if the word "staff" referred to the staff of the Enterprise, then the cost of training should not be borne by the Joint Venture Company. On the other hand, if it referred to staff of the Joint Venture Company, then the cost of training should be borne by the company. It was stated that training should not be an obligation and that as equal partners in the joint venture, these matters should be freely negotiated between the Enterprise and the Participant. The attention of the Special Commission was drawn to paragraph 12 (a) (ii) of resolution II, article 144 (2) (b) and article 15 of Annex III as provisions that make training by the Participant obligatory. It was pointed out that paragraph 12 (a) (ii) of resolution II was applicable only in the preparatory phase, and that when the Convention entered into force and effect it would no longer be applicable.

SECTION 10

Procurement of goods and services

In the procurement of goods and services, the Joint Venture Company shall issue invitations to tender and award contracts to bidders offering the best combination of quality, price and delivery time.

Annotation

It was suggested that all tenders be internationally advertised, thus avoiding hidden solicitations and inducements by suppliers and contractors.

SECTION 11

Transactions with affiliates

11.1 Every transaction between the Joint Venture Company and the Participant or an affiliate shall be on the basis of arm's length prices and such other terms and conditions as would have applied in a normal commercial manner in the ordinary course of business had the transaction occurred between unrelated parties or if the parties were not in any special relationship.

11.2 The Participant shall submit to the Enterprise within 60 days after the end of each calendar quarter a report listing each transaction or series of related transactions between the Joint Venture Company and the Participant or an affiliate in an amount equal to or greater than $US [ ] during the reporting period. Each report shall include the name of the parties to the transaction, the date and nature of the transaction and the amount involved. Transactions in an amount less than $US [ ] may be reported in the aggregate.

11.3 At the request of the Enterprise, and at the Joint Venture Company's cost, the Joint Venture Company's independent auditors shall examine the books and records of the Joint Venture Company and the Participant and give the Enterprise an opinion as to the correctness of any such report.

SECTION 12

Books and records

12.1 The Enterprise or the Participant as manager of the Joint Venture Company shall keep books and records of all of the operations of the Company under this contract in the _______ language [one of the languages of the Authority].

12.2 A set of such books and records shall be maintained at __________.

SECTION 13

Reports

13.1 The Participant or the Enterprise as manager of the Joint Venture Company shall promptly submit to the other party copies of all reports sent to the Authority.

13.2 In addition thereto, the Participant or the Enterprise as manager of the Joint Venture Company shall submit the following reports to the other party at the times indicated:

> [Specify such reports, e.g. monthly management reports, profit and loss statements, balance sheets and cash flow statements, production statements, sales reports.]

13.3 The Enterprise or the Participant as manager of the Joint Venture Company shall also submit such other reports concerning its operations under this contract as the other party may reasonably request.

13.4 All such reports shall be in the language specified in Section 12.1.

Annotation

It was pointed out that the problem of ownership had not been properly addressed in the section. It was also pointed out that the question of management should be addressed in section 2, Scope.

SECTION 14

Examination and inspection

14.1 The Enterprise and the Participant and their duly authorized officers, accountants, employees, agents and attorneys shall have the right, at all reasonable times, to examine and make extracts from the books and records of the Joint Venture Company which are required to be kept in accordance with this contract.

/...

14.2 The Enterprise and the Participant and their duly authorized representatives shall have the right, at any reasonable time, to enter upon any of the Joint Venture Company's installations and facilities in the area covered by this contract for the purpose of monitoring its activities for compliance with the terms and conditions of this contract.

14.3 The Enterprise and the Participant as manager of the Joint Venture Company shall assist such representatives in the performance of their duties and provide access to all relevant equipment, facilities and personnel on vessels and installations at all reasonable times.

14.4 Each such representative shall have reasonable access to any of the Joint Venture Company's vessels or installation's records, including its log documentation, and all other recorded data, for purposes of inspection and copying.

14.5 The Joint Venture Company at its expense shall provide each such representative while on board any of its vessels or installations with food, appropriate accommodations and medical facilities, and direct access to all communication equipment and facilities.

14.6 All such representatives shall avoid interference with the safe and normal operations on board vessels and installations used by the Joint Venture Company to carry out activities in the area covered by this contract.

Annotation

It was suggested that in section 14.1, the following words should be added to the text: "... and in accordance with generally recognized accounting principles and procedures".

SECTION 15

Assignment and transfer

The Enterprise and the Participant shall each:

(a) have the right to assign and transfer its obligations as manager of the Company under this contract to a transferee to the same extent that its obligations are transferable under the approved plan of work and the regulations; and

(b) have the right to sell, assign, transfer, convey or otherwise dispose of any of its equity shares in the Joint Venture Company to any third party with the prior consent of the other party, which consent shall not be unreasonably withheld.

Annotation

The view was expressed that the commentary did not provide that the other party should have the preferential right to purchase the share which the party wishes to give up. It was suggested that the provision in 15 (a) needed to be brought in line with section 15 (b) to the effect that no assignment or transfer could take place without the prior consent of the other party in writing. Another view was that right of first refusal also meant the right of preemption, and that it is a preferential right or right of preemption. A proposal was made to redraft section 15 (b) to provide clarity. In the proposal, section 15 (b) is to read as follows:

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"The Enterprise and the Participant shall each have the right to sell, assign, transfer, convey or otherwise dispose of any of its equity shares in the Joint Venture Company to the other Party or to any third party with the prior consent of the other party, which consent shall not be unreasonably withheld."

SECTION 16

Force majeure

16.1 Neither party shall be liable to the other for an unavoidable delay or failure to perform any obligation under this contract due to an event of *force majeure*. For purposes of this contract, an event of *force majeure* shall mean an event or condition which the party could not reasonably be expected to prevent or control; provided that the event or condition was not caused by negligence or by a failure to observe good mining industry practice.

16.2 Each party's duty to perform an obligation affected by such event shall be suspended for a period equal to the delay resulting from the occurrence of such event.

16.3 A party invoking this section shall take all reasonable measures to remove its inability to perform and comply with the terms and conditions of this contract with a minimum of delay; provided that the party shall not be obligated to resolve or terminate any labour dispute except on terms satisfactory to it or pursuant to a final decision of any agency having jurisdiction to resolve the dispute.

16.4 Each party shall give notice to the other party of the occurrence of an event of *force majeure* as soon as possible, and similarly give notice to the other party of the restoration of normal conditions.

Annotation

Following a debate as to whether to enumerate the conditions which constitute force majeure or not, and whether to include the word "foresee" in section 16.1 before the word prevent, it was decided to maintain section 16.1 as is and return to the question on the second reading of the working paper. It was noted that the wording of the clause is one that is used internationally and may derive from the International Chamber of Commerce publication No. 421.

SECTION 17

Termination

17.1 The Enterprise and the Participant may each by notice terminate this contract without prejudice to any other rights that it may have:

(a) if the other party fails to comply with any final award made as a result of arbitration proceedings pursuant to the approved plan of work or this contract;

/...

(b) if the other party is in material breach of any of the provisions of this contract and does not cure such breach within 90 days after notice to do so; or

(c) if the other party or the Joint Venture Company becomes insolvent or commits an act of bankruptcy or is adjudged a bankrupt or enters into any agreement for composition with its creditors or goes into liquidation or receivership, whether compulsory or voluntarily, or petitions or applies to any tribunal for the appointment of a trustee or receiver for itself or commences any proceedings relating to itself under any law relating to bankruptcy, insolvency or the readjustment of debt, whether now or hereafter in effect, other than for the purpose of reconstruction.

17.2 Upon the final termination of this contract for whatever reason and at whatever time, the parties shall have the obligation to comply satisfactorily with the obligations between themselves and with third parties arising under the terms of this contract.

Annotation

The question of whether material breach as contained in section 17.1 (b) should be substituted for by fundamental breach in section 17, Termination, was deferred until the second reading of the working paper. Regarding the question of whether or not the contract could be terminated in case of force majeure, a proposal to add a new subsection (d) to section 17.1 was made to read as follows:

> "If an event of force majeure has occurred and has lasted uninterrupted for a period of ... months".

It was suggested that section 17.2 may need to be improved. It was noted that it provides for termination of the contract, but that under section 17.1 (c) termination is also available in the event of bankruptcy. It was pointed out that the intention of section 17.2 was that where the contract was terminated under section 17.1, it did not have the effect of cancelling the obligations of the parties which had already arisen. It was suggested that section 17.2 should have been written in the negative rather than the positive sense so that the effect of termination does not negate obligations. The observation was made that if a party to the joint venture becomes bankrupt then the reason for its inability to honour its obligations would be bankruptcy and not the termination of the contract. It was proposed that section 17.2 be redrafted to read as follows:

> "Termination of this contract pursuant to this section shall not operate to discharge, terminate or extinguish rights and obligations which have already arisen under the terms of this contract".

It was also noted that since this model contract only applies to the relations between the Enterprise and the Participant, the provision in section 17.2 could not be applied to third parties. It was decided that this point would be reflected in an annotation to section 17.

SECTION 18

Waiver

18.1 Failure or delay by any party in the exercise of any right hereunder shall not be considered to be a waiver of such right.

18.2 No waiver of any right hereunder shall be effective as against a party hereto unless such party shall have waived such right in writing, and no such waiver of one right hereunder shall be deemed to be a waiver of any other right not so waived.

Annotation

It was noted that the provision sought to preserve the right of the parties if it became necessary to do so. If a party sits on its right then this cannot be interpreted as a waiver of its rights. The view was expressed that the provision in section 18.1 was too flexible in that the waiver seems to be given in perpetuity.

SECTION 19

Notice

19.1 All notices, approvals, directions, designations, consents, requests or instructions hereunder shall be made in writing and shall be served by hand, telex, telefax or by pre-paid registered post to the Enterprise or to the Participant at the following addresses:

THE ENTERPRISE:

THE PARTICIPANT:

19.2 Either party may change any such address by not less than ten days' notice to the other party.

19.3 (a) delivery by hand shall be deemed to be effective when made;

(b) delivery by telex shall be deemed to be effective when the "answer back" appears on the sender's telex machine;

(c) delivery by telefax shall be deemed to be effective when the "transmit confirmation report" confirming the transmission to the receiver's telefax number is received by the transmitter;

(d) delivery by registered post shall be deemed to be effective on the fourteenth day after the day of posting by pre-paid registered post, unless the contrary is proved by the addressee.

19.4 Notice to either party shall constitute effective notice to that party for all purposes under this contract and for the service of process or notification in any proceeding of any court or tribunal having jurisdiction.

SECTION 20

Revision

20.1 When circumstances have arisen or are likely to arise which, in the opinion of the Enterprise or the Participant, would render this contract inequitable or make it impracticable or impossible to carry out the approved plan of work in accordance with the terms and conditions of this contract and the regulations, the parties shall enter into negotiations to revise this contract accordingly.

20.2 Except as otherwise provided herein, this contract may be revised, amended or otherwise changed only with the consent of the Enterprise and the Participant by an appropriate instrument signed by the authorized representatives of the parties.

Annotation

The view was expressed that sections 20.1 and 20.2 should be joined into a single paragraph. Another view was that the provision would become a little cumbersome if the two paragraphs were combined. An observation was made regarding the word inequitable in section 20.1. It was stated that the notion of inequitability is subjective, and that as subjective as it may be, either party may plead inequitability. The view was expressed that inequitability was not a sufficient reason to revise a contract, and that a contract should not be revised only because one party has failed to advance in the way it expected to. It was also suggested that the circumstances mentioned in section 20.1 would have to be extraordinary, unexpected circumstances in order to justify a renegotiation of the contract.

SECTION 21

Disputes

21.1 Unless otherwise provided in this contract or in the regulations, or the parties otherwise agree, any dispute between the Enterprise and the Participant concerning the interpretation or application of this contract shall be submitted, at the request of either party, to arbitration in accordance with the UNCITRAL Arbitration Rules. Unless the parties otherwise agree, the arbitration shall be held at __________ and conducted in the language specified in Section 12.1.

21.2 The arbitration tribunal shall have no jurisdiction to decide any question of interpretation of the Convention. When the dispute also involves a question of the interpretation of Part XI and the Annexes relating thereto with respect to activities in the area covered by this contract, that question shall be referred to the Sea-Bed Disputes Chamber for a ruling.

21.3 If at the commencement of or in the course of such arbitration, the arbitration tribunal determines, either at the request of any party to the dispute or proprio motu, that its decision depends upon a ruling of the Sea-Bed Disputes Chamber, the arbitral tribunal shall refer such question to the Sea-Bed Disputes Chamber for such ruling. The arbitral tribunal shall then proceed to render its award in conformity with the ruling of the Sea-Bed Disputes Chamber.

Annotation

It was suggested that before either party resorts to arbitration, it is necessary to resort to the procedures mentioned in article 33 of the United Nations Charter, i.e. negotiation, enquiry, mediation and conciliation. It was requested that the text of section 21 be amended to include this point.

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SECTION 22

Applicable law

22.1 This contract shall be governed by the terms of this contract, the regulations, Part XI of the Convention and other rules of international law not incompatible with the Convention, and, to the extent not inconsistent therewith, the laws of ______.

22.2 Any final decision rendered by a court or a tribunal having jurisdiction under the Convention relating to the rights and obligations of the Enterprise and of the Participant, shall be enforceable in the territory of each State which has consented to be bound by the Convention and for which the Convention is in force.

SECTION 23

Supplementary documents

Each party undertakes that it will from time to time do all such acts and make, enter into, execute, acknowledge and deliver at the request of the other party such supplementary or additional instruments and documents as may be reasonably required for the purpose of implementing or assuring the rights and obligations of that party under this contract.

Annotation

It was decided that the section should be redrafted to reflect usual practice. It was pointed out that in the commentary in WP.18/Add.1, section 22 was based on article 21 (1) of Annex III. Annex III deals with a special kind of contract, i.e., the contract between the Authority and the contractor. It was noted that in the working paper, one is dealing with a joint venture contract between the Participant and the Enterprise. There would be two contracts, one between the Authority and the Enterprise for a plan of work and the second between the Enterprise and the entity which joins in a joint venture. Since article 21 (1) of Annex III does not deal with the same subject matter, following that provision would straitjacket the Enterprise.

LOS/PCN/SCN.2/WP.18/Rev.2
7 December 1993

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEABED AUTHORITY
AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2
New York, 10-21 August 1992

The joint venture option for the Enterprise

DRAFT BASIC JOINT VENTURE CONTRACT WITH ANNOTATIONS MADE IN SPECIAL COMMISSION 2

(Working paper by the Secretariat)

INTRODUCTION

1. In its consideration of item (iii) of its programme of work, "Development of policies and feasibility studies in preparation for the early entry into effective operation of the Enterprise", Special Commission 2 recognized the need to give priority attention to joint ventures as a method of operation for the Enterprise. It was pointed out that in 1971, when the Latin American Group had introduced a 13-point power draft to deal with the international seabed area, the joint venture option was felt to be the only option for exploration, exploitation and processing of polymetallic nodules from the Area.

2. Throughout its deliberations on operational options, preference was expressed by the Special Commission for the joint venture option as the appropriate contractual device to ensure that the seabed is efficiently exploited. In that regard, a number of statements and working papers were heard and considered by the Special Commission. During the second session (1984), a preliminary note, "Preparatory work in relation to the Enterprise", and a proposal, "Austrian proposal before the Preparatory Commission for the International Seabed Authority", submitted by the Asian-African Legal Consultative Committee (AALCC), were circulated to the Special Commission. During the second session, the delegation of Austria had submitted a proposal to establish a Joint Enterprise for Exploration, Research and Development in Ocean Mining (JEFERAD) in the following documents: LOS/PCN/SCN.2/L.2, "Austria:

Proposal for a Joint Enterprise for Exploration, Research and Development in Ocean Mining (JEFERAD)"; LOS/PCN/SCN.2/L.2/Add.1, "Addendum. Austria: Proposal for a Joint Enterprise for Exploration, Research and Development in Ocean Mining (JEFERAD)". Additional explanatory notes were conveyed to the Special Commission for the Enterprise in the statement of the delegation of Austria on 23 March 1984 and LOS/PCN/SCN.2/L.2/Rev.1, "Austria: Proposal for a Joint Enterprise for Exploration, Research and Development in Ocean Mining (JEFERAD)".

3. LOS/PCN/SCN.2/WP.3, "Information note on elements of joint ventures", was requested by the Special Commission and considered by it during the resumed second session (1984, Geneva). This working paper outlined considerations relevant to the conclusion of joint venture agreements. LOS/PCN/SCN.2/WP.4, "Proposal on a joint venture - Proposals by the delegations of Belgium, France, the Federal Republic of Germany, Italy, Japan, the Netherlands and the United Kingdom of Great Britain and Northern Ireland" was also presented at the resumed second session. That working paper, while recognizing that no hard-and-fast criteria could be established for a successful joint venture agreement, noted the importance of allowing the Governing Board of the Enterprise sufficient flexibility when negotiating with prospective partners. It discussed some of the key elements for establishing a successful joint venture agreement based on a model agreement contained in document LOS/PCN/SCN.2/WP.5, "A model joint venture agreement for seabed mining", submitted by the delegation of the Federal Republic of Germany.

4. LOS/PCN/SCN.2/WP.5 contained a model agreement for establishing a joint venture between the Enterprise and national or transnational, private or State-owned companies or consortia. The model agreement was not meant to tie discussions down to the specific clauses contained therein, but rather to identify the issues that would have to be addressed and equitably solved if a mutually beneficial joint venture relationship was to be concluded between the concerned parties. At the request of the Special Commission, during the fifth session (1987, Kingston), the delegation of Colombia submitted document LOS/PCN/SCN.2/WP.4, "The International Venture". That study provided a further analysis of a joint venture between pioneer investors and the Enterprise, placing special emphasis on exploration, research and development, and the training of personnel.

5. At the resumed eighth session (1990, New York), Special Commission 2 began consideration of document LOS/PCN/SCN.2/WP.18, "Draft basic joint venture contract", and document LOS/PCN/SCN.2/WP.18/Add.1, "Draft basic joint venture contract - Explanatory memorandum", which were prepared by the Secretariat to facilitate concrete discussions on joint ventures. In introducing the working papers, the Special Representative of the Secretary-General recalled that during the meetings of the Seabed Committee and the Third Conference on the Law of the Sea, considerable importance had been given to the idea of a joint venture as the sole mechanism for the development of the resources of the seabed. He noted that in response to the request by the Special Commission, the Secretariat had assembled information on joint ventures in the petroleum, mining and other industries to produce the single model contained in LOS/PCN/SCN.2/WP.18. He pointed out that the model did not contain all the details which were needed for a joint venture arrangement.

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6. In conducting its work, the Special Commission decided to undertake a section-by-section reading of the two documents, which helped to focus attention on the joint venture option without detracting from other operational options. It decided further to provide annotations, as appropriate, both to the sections contained in LOS/PCN/SCN.2/WP.18 and to the explanatory memorandum.

General comments

7. With regard to the explanatory memorandum in the working paper, the view was expressed that a decision with respect to the joint venture option would depend on how the following points were addressed:

(i) The form the joint venture would take, that is, contractual or incorporated;

(ii) The ratio of capital participation of the joint venture partners; in the case of the Enterprise, it was noted that this would depend on the rate of contributions of countries that had ratified the Convention;

(iii) The need to ensure that the decision-making mechanism within the joint venture recognized the Enterprise's right to have a say in its affairs;

(iv) Transfer of technology (sect. 8 of the working paper);

(v) Training (sect. 9);

(vi) The manner in which conflicts would be resolved between the partners (sect. 21).

8. With regard to the type of joint venture arrangement used as a model in the working paper, i.e., the incorporated rather than the contractual, questions were raised as to why the former model had been chosen when the explanatory memorandum had indicated the advantages of the contractual joint venture. It was noted that the basic intentions of the two parties would be reflected in the provisions of either the contractual or the incorporated joint venture and that the difference would be in the modality of implementation.

9. It was pointed out that concentrating the discussion on joint ventures on annotations to LOS/PCN/SCN.2/WP.18, which is a model contract for an incorporated joint venture, did not provide the Special Commission with an opportunity to discuss the contents of a contractual joint venture model for which general preference had been expressed. The advantages of the contractual joint venture are clearly highlighted in LOS/PCN/SCN.2/WP.18, in particular its paragraphs 15, 16 and 19.

10. The basic principles of annex III, article 11, of the Convention, which envisages joint ventures between the contractor and the Authority, were recalled, as was the fact that contractual arrangements can only be entered into by entities sponsored by a party to the Convention. It was emphasized that research and development was an essential component of high-technology ventures such as seabed mining, and that the need for research and development could not

be overstated during the early phases of the work of the Enterprise, when exploration may not take place.

11. The Group of Six, in a general statement on the subject of joint ventures, reaffirmed the statement which the Group had made at the resumed eighth session in New York. It was stated that the Group shared the general acceptance of the joint venture option as the preferred option for the Enterprise in its initial operations. The Group was of the opinion that that option offered many advantages and that it might contribute to solving problems raised by some of the provisions of the Convention and its annexes. The Group had taken account of the fact that the provisions of joint venture agreements depend on the particular characteristics of the project and the objectives of each of the participants, as paragraph 11 of working paper 18 indicates. It had therefore decided that it was premature to decide on any clauses of a future joint venture agreement. At that stage, the Group was of the opinion that the model agreement could only serve illustrative purposes, as was rightly stated in paragraph 8 of working paper 18. The Group of Six stressed that the model joint venture contract contained in documents WP.18 and Add.1 as well as the proposals presented in documents LOS/PCN/SCN.2/WP.4 and WP.5 could serve only as a source for partners in the joint venture when they devised a draft for such an agreement.

Explanatory memorandum

12. Joint venture arrangements as a method of operation for the Enterprise have been the subject of consideration by the Preparatory Commission at various times since 1983. Indeed, they were the subject-matter of extensive discussions during the Conference itself and were for a long time considered to be the norm for the operations of the Enterprise.

13. Annex III, article 11, paragraph 1, of the Convention specifically states that:

> "Contracts may provide for joint arrangements between the contractor and the Authority through the Enterprise, in the form of joint ventures or production sharing, as well as any other form of joint arrangement ...".

14. Already at the resumed second session of the Preparatory Commission the Secretariat had submitted a background paper, "Information note on elements of joint ventures" (LOS/PCN/SCN.2/WP.3), in response to a request made by the Special Commission.*

15. The Special Commission has looked at various operational options for the Enterprise, and in the course of those discussions it was suggested that the initial operations of the Enterprise should be through a joint venture

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* See also the preliminary note submitted by the secretariat of the Asian-African Legal Consultative Committee of 6 February 1984 and the introduction to the Model Joint Venture Agreement for Seabed Mining submitted by the Federal Republic of Germany (LOS/PCN/SCN.2/WP.5).

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arrangement. Indeed, the Chairman of Special Commission 2 reported to the plenary at the end of the resumed third session, on 4 September 1985, that:

> "... it is to be noted that many delegations continue to believe that a joint venture may be the most likely option for the first project of the Enterprise, from the point of view of practicality and minimization of risks. The advantages of a joint venture for both mining and processing have been stressed particularly as regards transfer of technology and development of manpower. Furthermore, some delegations have suggested that when the Special Commission takes up the question of joint ventures in detail, both equity and contractual joint ventures should be studied." (LOS/PCN/L.25, para. 16)

16. At the resumed fourth session, on 5 September 1986, the Chairman, reporting on the work of Special Commission 2, stated:

> "In the same vein, delegations have suggested that the Special Commission should restrict the scope of its recommendations on operational options, confining itself, unless conditions change, to those options that would better facilitate the start-up of operations. Particular mention has been made of the joint venture and leasing options in that context." (LOS/PCN/L.40, para. 4)

17. Furthermore, at the end of the sixth session, on 8 April 1988, the Chairman of Special Commission 2 reported that:

> "... the Special Commission predicts that it will be possible, even during the interim period, to narrow down the likely range of options that the Enterprise would consider. In this event, the work of the Special Commission would be adjusted to take this into account. Special mention was made of joint ventures and of their complexities, which would indicate the need to allow sufficient time to assemble the necessary information and prepare any working papers needed." (LOS/PCN/L.60, para. 15)

18. It is pursuant to that request for a working paper on joint ventures that the Secretariat has prepared the Model Joint Venture Contract presented below.

19. The present working paper briefly discusses the joint venture arrangements by way of an introduction to the Model Joint Venture Contract, which has been prepared for illustrative purposes. A commentary on the provisions is contained in an addendum to the paper.

20. A joint venture is one of several kinds of arrangements from which two or more entities choose the most effective and efficient mode of operations to best meet their objectives and their financial, technical and other circumstances. The joint venture arrangement differs from others in that it is a commercial relationship organized in order to carry out a particular project or venture over a comparatively long duration, which is characterized by its "jointness" or sharing of ownership, profits, risks and decision-making. This distinguishes the joint venture from other forms of commercial arrangements, such as service contracts, technical agreements, turn-key contracts, etc.

21. The joint venture has a flexible structure which allows for a variety of arrangements with regard to ownership, the contributions of the participants and the allocation of profits, risks and decision-making between them, none of which need bear any relationship to any of the others. This would allow a number of disparate participants of different nationalities and themselves having different forms (States, State enterprises, individuals, partnerships, corporations, other forms of enterprises or combinations thereof) to form one commercial entity for a particular venture.

22. It is important to note that the provisions in every joint venture agreement depend on the particular characteristics of the project and the objectives of each of the participants. The number of permutations and commutations in this regard are almost unlimited, but the basic provisions concern ownership, the contributions of the parties in cash and in kind (both tangible and intangible), the sharing of profits and of risks, management decisions and control, and the settlement of disputes. These are central, but a whole host of other matters need to be negotiated. Any model cannot contain all such details and choices.

23. There are two types of joint ventures: the incorporated joint venture and the contractual joint venture. The former involves sharing of ownership through a separate legal entity incorporated for that purpose. It is then a corporation under a particular municipal law and the liabilities of the participants (the equity shareholders) are limited in accordance with that law. That law sets out how the participants will make their contributions and how the profits, risks and decision-making will be shared, subject to modification by the participants within certain parameters. An incorporated joint venture as a legal entity may be subject to taxation, separate from its participants, in accordance with the laws of the country of its incorporation and the countries in which it carries on business.

24. In the contractual joint venture, no separate legal entity is established and the ownership of assets is shared; the rights and obligations of the participants are set out entirely in the contract which establishes the business relationship. As the rights and obligations of the parties are governed solely by what is agreed upon in the contract, it must state how the assets will be acquired and owned and how the participants will share the profits, risks and decision-making. While the participants can allocate liabilities as between themselves, the liabilities with regard to third parties are usually not limited, but are joint and several. However, participants usually try to limit their liabilities in a contractual joint venture by organizing a separate limited liability company, a wholly owned subsidiary, to enter into the joint venture contract and carry out its obligations. The risk is then, subject to certain exceptions, limited to the amount of the paid-in equity capital of that company. The contractual type of joint venture is often used in large construction and other projects for financing purposes where each participant makes its own financing arrangements.

25. Since a separate legal entity is not established, a contractual joint venture as such is not subject to taxation, but each of the participants is subject to taxation in accordance with the law applicable to that participant.

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For that reason, this kind of arrangement has been used in multinational arrangements in a number of sectors, such as petroleum, mining and construction.

26. Thus a contractual joint venture might offer advantages for the Enterprise (which has certain privileges and immunities under the Convention) as well as for other entities.

27. Joint venture arrangements could be used for reserved and unreserved areas. There are a number of reasons for the parties to form a joint venture. It is likely that a participant might wish to enter into a Joint Venture Contract in order to limit its liabilities to the extent of its share of the joint venture pursuant to annex III, article 11, paragraph 3. But joint ventures could also be a mechanism to provide financial incentives to contractors by providing them with faster cash flows, thus enabling them to begin seabed mining earlier than otherwise. In this respect, the contractual form could be more advantageous than the incorporated form, as cash flows could be more direct and not dependent on the declaration of dividends.

28. The joint venture arrangement could also be used to limit the capital and loan requirements of the Enterprise and to reduce risks and liabilities. In doing so, the Enterprise would also be able to start operations at an earlier time than might otherwise be financially possible.

29. Joint ventures could also provide a mechanism for the Enterprise to obtain technology and to train personnel so as to become operational sooner than might otherwise be the case.

30. The model contract which follows has been prepared for an incorporated joint venture, which is still the more usual form, though contractual joint ventures have been increasingly popular in recent years in a number of countries with widely differing economic systems. The model could be readily adapted to a contractual joint venture by including the standard provisions which form part of the rules governing incorporated companies in national laws. Those provisions were not reproduced as they would only add bulk to the model without adding much to the principles of joint venture arrangements at the current stage.

31. The use of the term "Participant" in the model contract is not to be construed as precluding more than one entity in their joint or several capacities entering into joint venture arrangements with the Enterprise.

32. The article-by-article commentary on the various sections of the model contract which is issued as an addendum to the present working paper is designed to assist the Commission in its consideration of the paper.

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JOINT VENTURE CONTRACT

BETWEEN

THE ENTERPRISE OF THE INTERNATIONAL SEABED AUTHORITY

AND

____

(State or Entity)

THIS CONTRACT, made the ____ day of ______________, between the Enterprise (hereinafter called "the Enterprise") of the International Seabed Authority (hereinafter called "the Authority") and ________________________________ (State or Entity), ________________________________ (Legal status) (hereinafter called "the Participant");

WHEREAS:

1. The Enterprise is the organ of the Authority which carries out activities in the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction;

2. The Enterprise and the Participant have agreed to form a joint venture company to carry out (exploration) (exploitation) (exploration and exploitation) in accordance with the terms and conditions of this contract;

NOW, THEREFORE, the Enterprise and the Participant agree as follows:

Annotation

It was suggested that after each party, the words "represented by" should be added since it was usual practice to add a reference to the person who had signed the Contract. It was also suggested that the definition of the Enterprise in the first preambular paragraph was restrictive when compared to the definition provided in annex IV, article 1. It was stated that since the Enterprise not only operated in the Area but also carried out other functions, there was a need to elaborate on the scope of its activities.

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SECTION 1

Definitions

For the purpose of this contract:

1.1 "affiliate" means any person, firm or company, directly or indirectly controlling, controlled by or under common control with the Participant. For purposes of this definition, "control" means the power to direct management and policies;

1.2 "applicable law" means the law applicable to this contract in accordance with section 22;

1.3 "approved plan of work" means the contract containing the plan of work referred to in section 2.3;

1.4 "area covered by this contract" means the seabed and ocean floor and subsoil of the area defined by the coordinates listed in annex A;

1.5 "Convention" means the 1982 United Nations Convention on the Law of the Sea;

1.6 "Authority" means the International Seabed Authority established by the Convention;

1.7 "Joint Venture Company" means the joint venture company formed pursuant to section 6.1;

1.8 "regulations" means the rules, regulations and procedures of the Authority.

Annotation

The view was expressed that if a definition had been given for the Authority then a definition should be given for the Enterprise. In this connection, it was suggested that the preambular paragraph referred to above should only state what the activity was, and that if a definition was included in section 1, it would need to conform to annex IV, article 1. Another view was that the Enterprise was a moral person of the contract and as a result did not need to be defined. The view was held that there may be a need to define the Participant. Finally, it was stated that it was usual practice to describe the contracting parties and not to define them. It appears, however, to be generally accepted that a definition is not necessary as long as the contracting parties are described within the contract.

The definition of applicable law in this section and provisions regarding it as contained in section 22 of the model contract resulted in considerable discussions. It was suggested that it would be necessary to delink section 1.2 from section 22 so that applicable law is defined as the law to be applied to the contract. It was also agreed to separate sections 22.1 and 22.2 since the former dealt with the applicable law which would govern the contract and the

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latter with enforcement of the law. Concern was expressed with section 22.2 and the inability of the Enterprise to enforce a decision against a partner who is not a party to the Convention. It was noted that since there cannot be a contract unless the entity, whether public or private, is sponsored by a Party to the Convention, the legal provisions in article 21 (1) of annex III must be built into the contract between the parties. It was also pointed out that it was necessary to distinguish between the substantive and procedural laws of the country of the contract, and that the applicable substantive laws are those to be applied and implemented when decisions need to be enforced.

SECTION 2

Scope

2.1 This contract is a Joint Venture Contract.

2.2 The Enterprise and the Participant shall form the Joint Venture Company to carry out (exploration) (exploitation) (exploration and exploitation) of polymetallic nodules from the area covered by this contract in accordance with sound market principles.

2.3 The Joint Venture Company shall apply to the Authority for approval of a plan of work for (exploration) (exploitation) (exploration and exploitation) in accordance with the regulations. Upon approval by the Council of the Authority, the Joint Venture Company shall enter into a contract with the Authority for the plan of work for (exploration) (exploitation) (exploration and exploitation) for the area covered by this contract. In the event that the Participant has already obtained the contract, the contract shall be assigned to the Joint Venture Company in accordance with the regulations.

2.4 The Participant shall be the manager of the Joint Venture Company from the date of its formation until _______________ and shall be responsible for the Joint Venture Company's carrying out activities under this contract with efficiency and economy in accordance with sound commercial principles and in compliance with applicable law and the terms and conditions of this contract, the approved plan of work and the regulations. Thereafter the Enterprise shall be the manager of the Joint Venture Company and shall have such responsibility.

Annotation

With regard to section 2, Scope, it was held that there was a gap in section 2.2. This arose because the working paper addressed itself solely to the assets of the joint venture and did not consider the issue of intellectual property and the ownership of patents which are involved in the transfer of technology in such a high-technology joint venture. It was noted that an essential component of any high-technology joint venture is research and development, and if the Enterprise were to be competitive in the market-place, then additional attention should be directed to this matter in the model contract.

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With regard to section 2.4, it was pointed out that this did not constitute usual practice. Usually, the company is managed by the party which holds at least 51 per cent of the shares of the company. Another view was that since the choice of the manager was dependent on the level of competence, sometimes the minor participant could be the manager. The view was expressed that the wording of section 2.4 might make the switch, for the Enterprise to become the manager mandatory. It was suggested further that the provision be reworded to allow for this flexibility. It was also noted that the provision should provide for the possibility of a third party becoming the manager of the company.

SECTION 3

Term

Subject to section 17, the term of this contract shall begin on the date hereof and end upon the expiration or termination of the approved plan of work.

Annotation

The view was expressed that the language of the section could be made clearer. It was pointed out that in the French text the contract would be in effect from the date of its conclusion, while usual practice was to state that the contract would enter into force on the date of signature. It was suggested that the article needed to stipulate that the contract would be terminated in the event of unusual circumstances such as bankruptcy. Another view was that this concern was covered by the provisions of section 17 (c) which deals with unusual circumstances.

SECTION 4

Responsibilities of the Participant

The Participant shall:

(a) carry out the activities under this contract as manager of the Joint Venture Company in accordance with section 2.4;

(b) thereafter, cooperate with the Enterprise so as to facilitate its performance as the manager of the Joint Venture Company.

Annotation

It was suggested that the list of the Participant's responsibilities was not exhaustive and that the Participant needed to present reports on production and other activities, and to report to the Board of Directors. In this regard, it was noted that while in section 5 (e), provision is made for the Enterprise to cooperate with the Participant in carrying out the training programme, there is no corresponding provision in section 4, obliging the Participant to train

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people for the Enterprise. Similarly, it has been noted that while the obligation of the Participant to transfer technology is provided for in section 8, that obligation is not reflected in this section.

Another view was that it was not necessary to add these obligations to section 4. A number of drafting proposals were made. It was suggested that section (a) be redrafted to read as follows:

> "Until the Enterprise assumes such responsibility the Participant shall carry out activities under this contract as manager of the Joint Venture Company in accordance with section 2.4",

and that section 4 (b) be redrafted as follows:

> "The Participant shall thereafter cooperate with the Enterprise so as to facilitate performance by the Enterprise of its responsibilities as the manager of the Joint Venture Company."

It was also suggested that a new section 4 (c) be added to read:

"The Participant shall provide training for the Enterprise."

SECTION 5

Responsibilities of the Enterprise

The Enterprise shall:

(a) furnish to the Joint Venture Company all relevant information held by it or by the Authority relating to the area covered by this contract;

(b) cooperate with the Participant so as to facilitate its performance as the manager of the Joint Venture Company until the date specified in section 2.3;

(c) thereafter carry out the activities under this contract as manager of the Joint Venture Company in accordance with section 2.4;

(d) cooperate with the Participant so as to obtain financial incentives from the Authority for the benefit of the Joint Venture Company; and

(e) cooperate with the Participant in carrying out the training programme, referred to in section 9 of this contract.

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SECTION 6

The Joint Venture Company

6.1 Within three months from the date hereof, the Enterprise and the Participant shall form the Joint Venture Company in accordance with the laws of ________________________. The headquarters of the Joint Venture Company shall be located in ______________ and its principal place of business in ______________.

6.2 The name of the Joint Venture Company shall be ________________. The Memorandum and Articles of Association of the Joint Venture Company shall be in such form as the Enterprise and the Participant agree and shall specify:

(a) the number and members and the powers of the Board of Directors; and

(b) The officers of the Joint Venture Company and their powers.

6.3 The capital of the Joint Venture Company shall be such total amount as shall be required to carry out the activities under this contract and shall consist of equity and loan capital in a ratio not to exceed ____________.

6.4 The equity shares of the Company shall be allotted [and paid for] as follows:

> [Schedule of payments in cash and in kind (tangible and intangible), amounts, currencies and dates for each party.]

6.5 Unless otherwise agreed by the parties, all shares in the Joint Venture Company shall be fully paid and rank pari passu for all purposes.

6.6 The loan capital of the Joint Venture Company shall be obtained as follows:

> [Amounts, currencies, sources, general terms, responsibilities of the participants and their liabilities, security, etc., to be specified.]

6.7 The Board of Directors of the Joint Venture Company shall not exceed [ ] members and the [ ] members shall be required for a quorum.

6.8 Each party shall appoint such number of members to the Board of Directors as shall be proportionate to its ownership interest to the nearest whole number and may remove and replace any member it has appointed at any time by notice to the other party. The Chairman shall be appointed for a term of two years. The Participant shall appoint the first Chairman from among the directors it has appointed and the Enterprise shall appoint the Chairman for the second term from among the directors it has appointed. Thereafter, the parties shall appoint the Chairman in turn.

6.9 The Joint Venture Company shall, not without the written consent of both parties:

(a) amend its Memorandum and Articles of Association;

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(b) pass a Special Resolution;

(c) appoint and remove independent auditors;

(d) create, merge, acquire, or consolidate with, any other company;

(e) sell, lease or otherwise dispose of all or a substantial part of its assets;

(f) acquire or maintain any property or assets other than those related to the conduct of its operations;

(g) make any loans save for temporary investment of cash balances and normal staff loans, extend any credits, guarantee any loans or otherwise pledge its credit;

(h) borrow money, other than:

- (i) to meet short-term cash requirements in the ordinary course of business;
- (ii) to carry out a financial plan approved by both parties;

(i) issue shares or rights to shares;

(j) mortgage, transfer plant and equipment, other than those which are redundant or obsolete, sublet, revalue. hypothecate or otherwise encumber any of its capital assets or interests therein;

(k) renounce any part of the area covered by this contract; or

(l) voluntarily dissolve, liquidate or wind up its affairs, or make an assignment for the benefit of creditors, or petition or apply to any tribunal for the appointment of a trustee or receiver for itself, or commence any proceedings relating to itself under any law relating to bankruptcy, reorganization, arrangement, insolvency or the readjustment of debt, whether now or hereafter in effect.

6.10 All matters before the Board of Directors of the Joint Venture Company shall be decided by majority vote except that the following decisions shall require the approval of not less than _____ of the Directors:

[Specify such decisions, e.g. appointment of the chief executive, approval of the annual budget, work programme, construction programme, procurements above a specified amount, insurance, production schedules, sales contracts, annual financial statements, establishment of and payment into reserves, dividend declarations.]

[Specify method of resolving deadlock.]

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Annotation

A number of views were expressed. In section 6.1 the view was put forward that the term "headquarters" in different legal systems could be interpreted in a number of ways. It was suggested that the provision be amended to read siège sociale and headquarters. It was pointed out that in English commercial law, the term "headquarters" is the principal place of business of the company. Regarding section 6.2, the view was expressed that it was necessary to elucidate all the details on the Articles of Association and the Memorandum of the Joint Venture Company. The need to specify the currency in which the capital of the Joint Venture Company would be paid was indicated in section 6.3. It was pointed out that since the Joint Venture could be for exploration and/or exploitation and that while the capital input of the two parties might be the same in the beginning, it would be different once exploitation commenced, because the Enterprise's equity would be an explored site. It was also suggested that since WP.18 was only a model contract, this type of specificity was not required.

Misgivings were expressed in relation to section 6.6. The point was made that the provision could result in the party providing the loan, mortgaging the collective loan capital of the company and thus hampering its work. It was stated in this connection that since the loan would have to be secured, a mortgage problem would indeed arise.

Regarding section 6.7, it was suggested that it would be necessary to specify the minimum number of the members of the Board of Directors and the number that constituted a quorum. The point was made that the section needed to specify how a decision would be taken if the number of votes on either side of an issue were equal, and whether or not the Chairman of the Board of Directors would have a casting vote.

Regarding section 6.9, it was stated that section 6.9 (b) was ambiguous and that it should either be deleted or it should specify what activities were prohibited. In relation to section 6.10, it was felt that the majority required for substantive issues should be more than a simple majority and that it should be left to the parties to decide on the actual percentages.

SECTION 7

Ownership of property

7.1 Upon termination of this contract all assets of the Joint Venture Company the costs of which have been fully recovered as Development Costs or Operating Costs, in accordance with the Regulations on the Financial Terms of Contracts, shall become the property of the Enterprise without charge.

7.2 Upon termination of the contract the Enterprise shall have the option to purchase any or all of the other assets of the Joint Venture Company at fair market value on an "as is where is" basis. The Enterprise shall have a period of 120 days to exercise its option, after which the Participant shall be entitled to transfer and remove within 18 months any property which the

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Enterprise shall not have exercised its option to purchase. Any property not removed from the area covered by the contract within a period of 24 months from the date of termination may then be acquired by the Enterprise without charge. The property not so acquired by the Enterprise shall then be removed at the expense of the Joint Venture Company.

Annotation

The view was expressed that it is usual practice for the assets of the company to be divided according to the number of shares held by each party. This view held that upon termination of the contract, debts would first be recovered and the remainder of the assets shared in proportion to the shareholding. Another view was that since the assets would have been fully recovered as Development or Operating Costs, these assets became the property of the Enterprise.

SECTION 8

Availability of technology

The Participant shall make available, or arrange for the Joint Venture Company to acquire, the technology necessary to carry out activities under this contract in accordance with a supplementary agreement.

Annotation

The view was expressed that upon termination of the contract, the technology should be transferred to the Joint Venture Company.

SECTION 9

Training

9.1 The Joint Venture Company shall provide training for staff nominated by the Enterprise at all administrative and technical levels relating to the Joint Venture Company's activities under this contract in accordance with the training programme.

9.2 The training programme shall be submitted by the Board of Directors of the Joint Venture Company for the approval of both parties before the commencement of activities under this contract.

9.3 The Board of Directors of the Joint Venture Company shall submit to both parties, within 90 days after the end of each calendar year, a report indicating the status of each person in the training programme and propose for approval such changes considered necessary or desirable to ensure the successful completion of the training programme by each such person. Upon approval by both parties, the training programme shall be amended accordingly.

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Annotation

It was stated that if the word "staff" referred to the staff of the Enterprise, then the cost of training should not be borne by the Joint Venture Company. On the other hand, if it referred to staff of the Joint Venture Company, then the cost of training should be borne by the company. It was stated that training should not be an obligation and that as equal partners in the joint venture, these matters should be freely negotiated between the Enterprise and the Participant. The attention of the Special Commission was drawn to paragraph 12 (a) (ii) of resolution II, article 144 (2) (b) and article 15 of Annex III as provisions that make training by the Participant obligatory. It was pointed out that paragraph 12 (a) (ii) of resolution II was applicable only in the preparatory phase, and that when the Convention entered into force and effect it would no longer be applicable.

SECTION 10

Procurement of goods and services

In the procurement of goods and services, the Joint Venture Company shall issue invitations to tender and award contracts to bidders offering the best combination of quality, price and delivery time.

Annotation

It was suggested that all tenders be internationally advertised, thus avoiding hidden solicitations and inducements by suppliers and contractors.

SECTION 11

Transactions with affiliates

11.1 Every transaction between the Joint Venture Company and the Participant or an affiliate shall be on the basis of arm's-length prices and such other terms and conditions as would have applied in a normal commercial manner in the ordinary course of business had the transaction occurred between unrelated parties or if the parties were not in any special relationship.

11.2 The Participant shall submit to the Enterprise within 60 days after the end of each calendar quarter a report listing each transaction or series of related transactions between the Joint Venture Company and the Participant or an affiliate in an amount equal to or greater than US$ [ ] during the reporting period. Each report shall include the name of the parties to the transaction, the date and nature of the transaction and the amount involved. Transactions in an amount less than US$ [ ] may be reported in the aggregate.

11.3 At the request of the Enterprise, and at the Joint Venture Company's cost, the Joint Venture Company's independent auditors shall examine the books and

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records of the Joint Venture Company and the Participant and give the Enterprise an opinion as to the correctness of any such report.

SECTION 12

Books and records

12.1 The Enterprise or the Participant as manager of the Joint Venture Company shall keep books and records of all of the operations of the Company under this contract in the _____ language [one of the languages of the Authority].

12.2 A set of such books and records shall be maintained at ________.

SECTION 13

Reports

13.1 The Participant or the Enterprise as manager of the Joint Venture Company shall promptly submit to the other party copies of all reports sent to the Authority.

13.2 In addition thereto, the Participant or the Enterprise as manager of the Joint Venture Company shall submit the following reports to the other party at the times indicated:

> [Specify such reports, e.g. monthly management reports, profit-and-loss statements, balance sheets and cash flow statements, production statements, sales reports.]

13.3 The Enterprise or the Participant as manager of the Joint Venture Company shall also submit such other reports concerning its operations under this contract as the other party may reasonably request.

13.4 All such reports shall be in the language specified in section 12.1.

Annotation

It was pointed out that the problem of ownership had not been properly addressed in the section. It was also pointed out that the question of management should be addressed in section 2, Scope.

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SECTION 14

Examination and inspection

14.1 The Enterprise and the Participant and their duly authorized officers, accountants, employees, agents and attorneys shall have the right, at all reasonable times, to examine and make extracts from the books and records of the Joint Venture Company which are required to be kept in accordance with this contract.

14.2 The Enterprise and the Participant and their duly authorized representatives shall have the right, at any reasonable time, to enter upon any of the Joint Venture Company's installations and facilities in the area covered by this contract for the purpose of monitoring its activities for compliance with the terms and conditions of this contract.

14.3 The Enterprise and the Participant as manager of the Joint Venture Company shall assist such representatives in the performance of their duties and provide access to all relevant equipment, facilities and personnel on vessels and installations at all reasonable times.

14.4 Each such representative shall have reasonable access to any of the Joint Venture Company's vessels or installation's records, including its log documentation, and all other recorded data, for purposes of inspection and copying.

14.5 The Joint Venture Company at its expense shall provide each such representative while on board any of its vessels or installations with food, appropriate accommodations and medical facilities, and direct access to all communication equipment and facilities.

14.6 All such representatives shall avoid interference with the safe and normal operations on board vessels and installations used by the Joint Venture Company to carry out activities in the area covered by this contract.

Annotation

It was suggested that in section 14.1, the following words should be added to the text: "... and in accordance with generally recognized accounting principles and procedures".

SECTION 15

Assignment and transfer

The Enterprise and the Participant shall each:

(a) have the right to assign and transfer its obligations as manager of the Company under this contract to a transferee to the same extent that its obligations are transferable under the approved plan of work and the regulations; and

(b) have the right to sell, assign, transfer, convey or otherwise dispose of any of its equity shares in the Joint Venture Company to any third party with the prior consent of the other party, which consent shall not be unreasonably withheld.

Annotation

The view was expressed that the commentary did not provide that the other party should have the preferential right to purchase the share which the party wishes to give up. It was suggested that the provision in 15 (a) needed to be brought in line with section 15 (b) to the effect that no assignment or transfer could take place without the prior consent of the other party in writing. Another view was that right of first refusal also meant the right of pre-emption, and that it is a preferential right or right of pre-emption. A proposal was made to redraft section 15 (b) to provide clarity. In the proposal, section 15 (b) is to read as follows:

> "The Enterprise and the Participant shall each have the right to sell, assign, transfer, convey or otherwise dispose of any of its equity shares in the Joint Venture Company to the other Party or to any third party with the prior consent of the other party, which consent shall not be unreasonably withheld".

SECTION 16

Force majeure

16.1 Neither party shall be liable to the other for an unavoidable delay or failure to perform any obligation under this contract due to an event of *force majeure*. For purposes of this contract, an event of *force majeure* shall mean an event or condition which the party could not reasonably be expected to prevent or control; provided that the event or condition was not caused by negligence or by a failure to observe good mining-industry practice.

16.2 Each party's duty to perform an obligation affected by such event shall be suspended for a period equal to the delay resulting from the occurrence of such event.

16.3 A party invoking this section shall take all reasonable measures to remove its inability to perform and comply with the terms and conditions of this contract with a minimum of delay; provided that the party shall not be obligated to resolve or terminate any labour dispute except on terms satisfactory to it or pursuant to a final decision of any agency having jurisdiction to resolve the dispute.

16.4 Each party shall give notice to the other party of the occurrence of an event of force majeure as soon as possible, and similarly give notice to the other party of the restoration of normal conditions.

Annotation

Following a debate as to whether to enumerate the conditions which constitute force majeure or not, and whether to include the word "foresee" in section 16.1 before the word "prevent", it was decided to maintain section 16.1 as is and return to the question on the second reading of the working paper. It was noted that the wording of the clause is one that is used internationally and may derive from International Chamber of Commerce publication No. 421.

SECTION 17

Termination

17.1 The Enterprise and the Participant may each by notice terminate this contract without prejudice to any other rights that it may have:

(a) if the other party fails to comply with any final award made as a result of arbitration proceedings pursuant to the approved plan of work or this contract;

(b) if the other party is in material breach of any of the provisions of this contract and does not cure such breach within 90 days after notice to do so; or

(c) if the other party or the Joint Venture Company becomes insolvent or commits an act of bankruptcy or is adjudged a bankrupt or enters into any agreement for composition with its creditors or goes into liquidation or receivership, whether compulsory or voluntarily, or petitions or applies to any tribunal for the appointment of a trustee or receiver for itself or commences any proceedings relating to itself under any law relating to bankruptcy, insolvency or the readjustment of debt, whether now or hereafter in effect, other than for the purpose of reconstruction.

17.2 Upon the final termination of this contract for whatever reason and at whatever time, the parties shall have the obligation to comply satisfactorily with the obligations between themselves and with third parties arising under the terms of this contract.

Annotation

The question of whether material breach as contained in section 17.1 (b) should be substituted for by fundamental breach in section 17, Termination, was deferred until the second reading of the working paper. Regarding the question of whether or not the contract could be terminated in case of force majeure, a

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proposal to add a new subsection (d) to section 17.1 was made, to read as follows:

> "If an event of force majeure has occurred and has lasted uninterrupted for a period of ... months".

It was suggested that section 17.2 may need to be improved. It was noted that it provides for termination of the contract, but that under section 17.1 (c) termination is also available in the event of bankruptcy. It was pointed out that the intention of section 17.2 was that where the contract was terminated under section 17.1, it did not have the effect of cancelling the obligations of the parties which had already arisen. It was suggested that section 17.2 should have been written in the negative rather than the positive sense so that the effect of termination does not negate obligations. The observation was made that if a party to the joint venture becomes bankrupt then the reason for its inability to honour its obligations would be bankruptcy and not the termination of the contract. It was proposed that section 17.2 be redrafted to read as follows:

> "Termination of this contract pursuant to this section shall not operate to discharge, terminate or extinguish rights and obligations which have already arisen under the terms of this contract".

It was also noted that since this model contract only applies to the relations between the Enterprise and the Participant, the provision in section 17.2 could not be applied to third parties. It was decided that this point would be reflected in an annotation to section 17.

SECTION 18

Waiver

18.1 Failure or delay by any party in the exercise of any right hereunder shall not be considered to be a waiver of such right.

18.2 No waiver of any right hereunder shall be effective as against a party hereto unless such party shall have waived such right in writing, and no such waiver of one right hereunder shall be deemed to be a waiver of any other right not so waived.

Annotation

It was noted that the provision sought to preserve the right of the parties if it became necessary to do so. If a party sits on its right then this cannot be interpreted as a waiver of its rights. The view was expressed that the provision in section 18.1 was too flexible in that the waiver seems to be given in perpetuity.

SECTION 19

Notice

19.1 All notices, approvals, directions, designations, consents, requests or instructions hereunder shall be made in writing and shall be served by hand, telex, telefax or by prepaid registered post to the Enterprise or to the Participant at the following addresses:

THE ENTERPRISE:

THE PARTICIPANT:

19.2 Either party may change any such address by not less than 10 days' notice to the other party.

19.3 (a) delivery by hand shall be deemed to be effective when made;

(b) delivery by telex shall be deemed to be effective when the "answer back" appears on the sender's telex machine;

(c) delivery by telefax shall be deemed to be effective when the "transmit confirmation report" confirming the transmission to the receiver's telefax number is received by the transmitter;

(d) delivery by registered post shall be deemed to be effective on the fourteenth day after the day of posting by prepaid registered post, unless the contrary is proved by the addressee.

19.4 Notice to either party shall constitute effective notice to that party for all purposes under this contract and for the service of process or notification in any proceeding of any court or tribunal having jurisdiction.

SECTION 20

Revision

20.1 When circumstances have arisen or are likely to arise which, in the opinion of the Enterprise or the Participant, would render this contract inequitable or make it impracticable or impossible to carry out the approved plan of work in accordance with the terms and conditions of this contract and the regulations, the parties shall enter into negotiations to revise this contract accordingly.

20.2 Except as otherwise provided herein, this contract may be revised, amended or otherwise changed only with the consent of the Enterprise and the Participant by an appropriate instrument signed by the authorized representatives of the parties.

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Annotation

The view was expressed that sections 20.1 and 20.2 should be joined into a single paragraph. Another view was that the provision would become a little cumbersome if the two paragraphs were combined. An observation was made regarding the word "inequitable" in section 20.1. It was stated that the notion of inequitability is subjective, and that as subjective as it may be, either party may plead inequitability. The view was expressed that inequitability was not a sufficient reason to revise a contract, and that a contract should not be revised only because one party has failed to advance in the way it expected to. It was also suggested that the circumstances mentioned in section 20.1 would have to be extraordinary, unexpected circumstances in order to justify a renegotiation of the contract.

SECTION 21

Disputes

21.1 Unless otherwise provided in this contract or in the regulations, or the parties otherwise agree, any dispute between the Enterprise and the Participant concerning the interpretation or application of this contract shall be submitted, at the request of either party, to arbitration in accordance with the UNCITRAL Arbitration Rules. Unless the parties otherwise agree, the arbitration shall be held at _____ and conducted in the language specified in section 12.1.

21.2 The arbitration tribunal shall have no jurisdiction to decide any question of interpretation of the Convention. When the dispute also involves a question of the interpretation of Part XI and the Annexes relating thereto with respect to activities in the area covered by this contract, that question shall be referred to the Seabed Disputes Chamber for a ruling.

21.3 If at the commencement of or in the course of such arbitration, the arbitration tribunal determines, either at the request of any party to the dispute or *proprio motu*, that its decision depends upon a ruling of the Seabed Disputes Chamber, the arbitral tribunal shall refer such question to the Seabed Disputes Chamber for such ruling. The arbitral tribunal shall then proceed to render its award in conformity with the ruling of the Seabed Disputes Chamber.

Annotation

It was suggested that before either party resorts to arbitration, it is necessary to resort to the procedures mentioned in Article 33 of the Charter of the United Nations, e.g. negotiation, enquiry, mediation and conciliation. It was requested that the text of section 21 be amended to include this point.

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SECTION 22

Applicable law

22.1 This contract shall be governed by the terms of this contract, the regulations, Part XI of the Convention and other rules of international law not incompatible with the Convention, and, to the extent not inconsistent therewith, the laws of _____.

22.2 Any final decision rendered by a court or a tribunal having jurisdiction under the Convention relating to the rights and obligations of the Enterprise and of the Participant shall be enforceable in the territory of each State which has consented to be bound by the Convention and for which the Convention is in force.

SECTION 23

Supplementary documents

Each party undertakes that it will from time to time do all such acts and make, enter into, execute, acknowledge and deliver at the request of the other party such supplementary or additional instruments and documents as may be reasonably required for the purpose of implementing or assuring the rights and obligations of that party under this contract.

Annotation

It was decided that the section should be redrafted to reflect usual practice. It was pointed out that in the commentary in WP.18/Add.1, section 22 was based on article 21 (1) of Annex III. Annex III deals with a special kind of contract, i.e, the contract between the Authority and the contractor. It was noted that in the working paper, one is dealing with a joint venture contract between the Participant and the Enterprise. There would be two contracts, one between the Authority and the Enterprise for a plan of work and the second between the Enterprise and the entity which joins in a joint venture. Since article 21 (1) of Annex III does not deal with the same subject-matter, following that provision would straitjacket the Enterprise.

PART TWO

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LOS/PCN/SCN.2/1984/CRP.1
20 March 1984

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Second session

PROGRAMME OF WORK

SPECIAL COMMISSION 2

1. Development of policies and feasibility studies in preparation for the early entry into effective operation of the Enterprise:
    - (a) Elaboration of operational options
    - (b) Project formulation
    - (c) Supplementary procedures for conduct of operations
2. Application of resolution II, paragraph 12, including
    - (a) development of a training scheme
    - (b) other measures to be taken under paragraph 12
3. Establishment of the organizational structure of the Enterprise:
    - (a) Draft Rules of Procedure of the Governing Board
    - (b) Draft Staff Rules
    - (c) Draft Financial Rules
    - (d) Establishment of the principal office of the Enterprise
    - (e) Administrative and financial arrangements
4. Formulation of recommendations for initial operations and administration of the Enterprise
5. Other questions, including
    - (a) Co-ordinative arrangements for dealing with matters relating also to the work of other bodies of the Preparatory Commission
    - (b) Establishment of an information programme on sea-bed resource development, including in particular, an information system on technology and technology suppliers.

LOS/PCN/SCN.2/1984/CRP.2
18 July 1984

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2

CONTRACTUAL RULES THAT MAY BE APPLICABLE TO THE IMPLEMENTATION OF PARAGRAPH 12 (a) (i) OF RESOLUTION II ON EXPLORATION

Note by the Secretariat

The general contractual rules contained in the present paper and the accounting rules and procedures in the annex have been prepared by experts of the Brazilian delegation with a view to enhancing the discussions of Special Commission 2 on the provisions contained in paragraph 12 (a) (i) of resolution II. It must be noted, therefore, that such rules would refer only to the application of paragraph 12 and not to the future rules governing the activities of the Enterprise or any other operator in the Area.

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PART I. GENERAL RULES

Rule 1

Purpose of these rules

Adopted under the terms of resolution II of the Third United Nations Conference on the Law of the Sea, these rules govern the procedures to be used in concluding contracts to which the Preparatory Commission is a party, and shall be referred to in shortened form as "contract rules".

Rule 2

Decisions on contracts

All decisions to be taken in order to contract for exploration under paragraph 12 of resolution II shall be the exclusive competence of the General Committee, as the executive organ for the Preparatory Commission.

Rule 3

Contract procedure

1. Contracts with private entities for exploration under paragraph 12 of resolution II shall be granted on the basis of competitive bidding.

2. Competitive bidding shall be waived in the event of the other party to the contract being a pioneer investor, in conformity with paragraph 12 (a) of resolution II, or if, in the judgement of the General Committee, the total value of the contract does not warrant such bidding.

Rule 4

Negotiations

1. The General Committee shall designate one of its members to conduct and co-ordinate the negotiations leading to the signing of the contract.

2. The General Committee may set up a technical organ to assist the co-ordinator of the negotiations.

Rule 5

Approval of the negotiations

Upon conclusion of the negotiations, the co-ordinator shall submit the results to the General Committee for approval with an explanatory note accompanying the draft contract reached by agreement with the other party.

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Rule 6

Signing and language of the contract

1. Once the results of the negotiations have been approved, under the terms of rule 5, the parties shall sign the original and two copies of the contract. One copy shall be given to the contractor; the original text shall be deposited with the Preparatory Commission.

2. The text of the original contract shall be drawn up in English. However, the contractor has the option of a second language text to be chosen from among the official languages of the United Nations. In this case, both texts shall be considered authentic.

Rule 7

Addenda

Any alteration of the contract in the course of its execution shall be made by means of an addendum which shall comply as pertinent with the conditions of these rules.

PART II. FORM AND CONTENT OF THE CONTRACT

Rule 8

Component parts and numbering of the terms of the contract

1. The terms of the contract and of its annexes shall be divided into a preamble, definitions (if necessary), articles, paragraphs and subparagraphs.

2. The articles and the paragraphs shall be numbered with Arabic numerals, the subparagraphs shall be indicated by small letters and the subparagraphs thereof shall be numbered with Roman numerals.

Rule 9

Title and content of the terms of the contract

1. The contract shall contain a preamble with the name and description of the parties, their respective postal and telegraph addresses, as well as the names and positions of the representatives who sign it.

2. Immediately following will be the articles with their titles and respective contents, to include the topics listed below:

(a) Purpose of the contract, which shall provide:

(i) A detailed description of the activities contracted for;

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(ii) An explanation of the way in which the activities will be carried out, the equipment and materials to be used, as well as other specifications which can be incorporated into the contract as annexes;

(b) Mutual obligations, listing in separate paragraphs the contribution and responsibilities of each of the parties to the contract;

(c) Cost, indicating the unit price, if applicable, and the total cost, whether final or estimated, of the service, work or production;

(d) Form of payment, describing the way in which payment will be made, and indicating the currency, the time period and the locality for the payment;

(e) Cost adjustment, explicitly defining the conditions under which a revision of the agreed prices is to be permitted, should this be necessary, with an indication of the formula and rates to be applied;

(f) Schedules, which shall indicate the commencement and termination dates of the contract, as well as the intervening dates, if the contractual obligations are to be executed by stages, specified in a schedule to be attached to the contract;

(g) Penalties, indicating the fines to which the contractor shall be subject in the case of contract infractions, which should be explicitly cited;

(h) Supervision, describing:

(i) The manner in which the supervision shall be exercised, who will exercise it and the extent of the powers to be granted the supervisors;

(ii) The facilities to be provided to the supervisors by the contractor to enable them to perform their duties on the site in which the contract is being executed;

(i) Delivery, determining the conditions and means of receipt, whether provisional or final, total or partial;

(j) Cancellation, expressly determining cases in which the contract may be invalidated and the responsibilities arising from the cancellation;

(k) Legal forum, indicating where and by whom possible disputes arising from the contract may be resolved, as well as the norms to be observed in the case of arbitration.

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PART III. - EXECUTION AND SUPERVISION

Rule 10

Administration and supervision of the contract

1. The contracts governed by these rules shall be administered by a designated member of the General Committee.

2. The General Committee may set up a technical group to assist the administrator of the contract and to supervise its execution, which may be done by a private entity qualified for the purpose.

Rule 11

Methods of supervision

1. The supervisor, who shall be designated from among the members of the technical group, shall carefully follow the contract operations through on-site visits and reports supplied by the contractor, bearing in mind the need for a faithful performance of the contractual obligations.

2. Any complaints as to non-compliance with the terms and specifications of the contract shall be sent to the contractor by letter with return-receipt requested.

Rule 12

Certification of contractual deficiencies

On certifying the occurrence of any contractual deficiencies for which a penalty has been stipulated, the supervisor shall immediately notify the contractor of that fact by letter, indicating the penalty which may have been incurred.

Rule 13

Waiver of penalty

1. If the contractor should incur a contractual penalty, the General Committee is empowered to waive it, should be contractor so request for good and valid reasons.

2. In the event the penalty is not waived, it shall be paid in the manner stipulated in the contract.

Rule 14

Termination of contract document

Upon satisfactory completion of the contract, a termination of contract document shall be drawn up for the signatures of the contractor and the supervisor, on behalf of the Preparatory Commission.

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PART IV. GENERAL TERMS

Rule 15

Different types of contracts

These rules do not apply to labour contracts, nor to contracts for insurance, foreign exchange and financing, which shall abide with prevailing international practice, with such modifications as may arise from the negotiations.

Rule 16

Applicable laws

1. In so far as applicable laws are concerned, the contract shall be governed by its own terms.

2. If the contract is entered into by the Preparatory Commission and a registered pioneer investor, under the terms of paragraph 12 of resolution II, the terms of the United Nations Convention on the Law of the Sea and its annexes shall also apply to it, whenever appropriate.

Rule 17

Supplementary instructions

These rules may be supplemented by instructions given by the co-ordinator of the negotiations, as well as by the administrator of the contract.

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Annex

ACCOUNTING RULES AND PROCEDURES

Article 1

Use of terms and scope

For the purpose of these rules:

(a) "Area" means the counterpart of a pioneer area as inferred from paragraph 3 (a) and (b) of resolution II;

(b) "Operations" means all activities performed by the contractor with a view to fulfilling its obligations as set forth in the contract;

(c) "Agency" means the branch, subsidiary, body or management set up by the contractor to conduct operations, on its behalf;

(d) "Contract accounts" means the accounts that record the costs related to the contract and reimbursable to the contractor;

(e) "Cost" means expense duly entered in the contract accounts according to criteria established in these rules;

(f) "Expense" means all effective expenditures or debt incurred by the contractor after signature of the contract, directly or indirectly, related to operations;

(g) "Material" means any kind of goods required for use in operations, excepting machinery, equipment, spare parts and tools.

Article 2

Accounting criteria

1. The accounting shall be carried out at the agency in accordance with generally recognized accounting principles and plans of accounts jointly drawn up by the parties.

2. The accounting entries shall be made in United States dollars and whenever an expense is incurred in any other currency it shall be converted into United States dollars in accordance with the relevant article herein.

3. All and any entry must be supported by documents which shall be kept by the agency until the termination of the contract.

4. The contractor shall make available to the accountants and auditors acting on behalf of the Preparatory Commission such financial and accounting data as are required to determine compliance with these rules and other relevant provisions of the contract.

5. For the purpose of reimbursement of costs to the contractor as provided for in paragraph 12 (a) (i) of resolution II, the contract accounts shall be audited in the course or at the end of the contract, in spite of what is set forth in article 4, paragraph 5, herein.

Article 3

Currency conversion

1. Expenses incurred in currencies other than United States dollars shall be recorded on the basis of the dollars that would actually be expended to acquire such currencies on the day expense has been incurred, at opening rates on the New York Exchange as informed by Reuters Agency.

2. The records and other documents indicating the exchange rates and procedures of conversion of different currencies into United States dollars shall be kept to be sent to the Preparatory Commission together with the statements referred to in article 4 of the present annex.

Article 4

Periodical accounting statements

1. The contractor, through the agency, shall draw up quarterly accounting and financial statements and forward them to the Preparatory Commission in the following 30 days for examination and approval.

2. The statements shall specify separately:

(a) The costs incurred in the quarter and those accumulated from the effective date;

(b) The exchange rates of conversion into United States dollars of expenses made in other currencies month by month;

(c) A summary of material stock and replacements.

3. Within 60 days of the receipt, the Preparatory Commission shall examine and ascertain the accuracy and relevance of the credits and debits entered.

4. If any discrepancy arises from such an examination, the parties will meet and try to settle it.

5. If the statements are found accurate and relevant or any disagreement has been settled, the manager of the contract will provisionally approve them on behalf of the Preparatory Commission.

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Article 5

Costs to be reimbursed

1. The costs to be reimbursed to the contractor are all expenditures incurred after signature of the contract in the exploration of the area covered by it and the activities related thereto for carrying out operations, including, inter alia:

(a) Expenditures for wages, salaries and employee benefits;

(b) Expenditures for materials, services, interest, utilities and preservation of the marine environment;

(c) Depreciation of machinery, ships, equipment and tools directly engaged in operations, according to the relevant provisions of the contract;

(d) Overhead and administrative costs specifically related to operations under the contract.

2. The amount resulting from valuation of materials no longer required for operations or the proceeds from disposal of them shall be deducted from the costs to be reimbursed to the contractor.

3. The costs referred to in the present article shall not be interpreted as including payments of corporate income taxes or similar charges levied by States in respect of the operations.

4. The costs incurred during any quarter shall be considered as effected in their entirety at the midpoint of such a quarter and the pertinent interest shall be calculated accordingly.

5. The payments due to the contractor shall be made in accordance with the relevant article of the contract.

NOTE: Some appendices are to be drawn up by the parties, as for instance (a) a basic plan of accounts; (b) a contract account code and (c) a form for materials stock statement.

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LOS/PCN/SCN.2/1988/CRP.3
15 June 1988

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2

DRAFT PRINCIPLES AND POLICIES FOR A PREPARATORY COMMISSION TRAINING PROGRAMME

Pursuant to resolution II, paragraph 12 (a) (ii), the Preparatory Commission hereby establishes a training programme for the interim period which will be carried out in the context of pioneer activities, as defined in resolution II, paragraph 1 (b).

The principles and policies governing the programme will be as follows.

1. Principles

1.1 Training must be planned and carried out in close co-operation between the registered pioneer investors and, as appropriate, the Certifying States on the one hand and the Preparatory Commission on the other.

1.2 Training must ensure the ability of the Enterprise not only to carry out activities in a timely manner but also to keep pace with States and other entities operating in the Area.

1.3 Training must cover all levels and aspects of sea-bed mining activities.

1.4 Training must aim at helping the Enterprise to recruit a sufficient number of personnel of high qualifications and technical competence.

2. Policies

2.1 The Preparatory Commission will designate a representative body to plan and carry out the Programme for the purposes set forth in the first principle.

2.2 The programme will provide training in all the different disciplines and skills required by the future Enterprise, to the same extent and level that these disciplines and skills are practised by the registered pioneer investors.

2.3 The programme will give initial priority to training in surveying and exploration, and assessment of the results thereof.

2.4 Implementation of the programme will be scheduled in such a way as to maximize the value and timeliness of the knowledge and experience gained by trainees, relative to the establishment of the Enterprise. Pioneer investors will, after their registration and at set intervals thereafter, advise the Preparatory Commission of the training opportunities arising out of their pioneer activities. In this connection, the registered pioneer investors will advise the Preparatory Commission of the financial implications of their proposed training schedules.

2.5 The programme will aim at maximum cost-effectiveness and the achievement of an appropriate balance as between the qualitative and quantitative requirements of the programme.

2.6 All signatories to the Convention will be entitled to nominate candidates for training. A register will be established to enter the nominations.

2.7 Selection of candidates from the register will represent designation by the Preparatory Commission in accordance with resolution II, paragraph 12 (a) (ii), and will be done bearing in mind the need to ensure both the highest possible standards and equitable geographical distribution amongst persons designated to receive training.

2.8 The programme will incorporate, as and when appropriate, both general and specialized training, and both theoretical and practical training. The training methods and facilities used by each registered pioneer investor, including those with a technological component, should be the best available to it.

2.9 Registered pioneer investors shall submit to the Preparatory Commission reports on each person trained, including a full description of the training provided and the context in which it was carried out.

2.10 The programme will require that Governments of trainees give assurances to the Preparatory Commission that the persons concerned will be appropriately reabsorbed in their professions or employed in related fields. These Governments will also be required to co-operate in making trained persons available to the Enterprise at its request and, in the interim period, to the Preparatory Commission should it require the services of these experts.

2.11 The programme will require that the Preparatory Commission, the trainees selected and their Governments co-operate in observing the procedures and formalities required by the States receiving the trainees.

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LOS/PCN/SCN.2/1989/CRP.4
20 March 1989

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2
Seventh session
Kingston, 27 February - 23 March 1989

DRAFT GUIDELINES AND PROCEDURES FOR THE IMPLEMENTATION OF THE TRAINING PROGRAMME

1.1 A training panel is hereby established to recommend to the Preparatory Commission the measures to be taken pursuant to the Principles and Policies established for the implementation of paragraph 12(a)(ii) of Resolution II.

1.2 The Panel shall consist of 15 members who are experts in appropriate fields. The composition of the panel will be determined by the Preparatory Commission and revised as required. The training panel shall meet during meetings of the Preparatory Commission, unless the Commission decides otherwise.

1.3 The training panel shall:

(a) Establish a training schedule based on information furnished by registered pioneer investors, in accordance with paragraph 2.4 of CRP.3, and bearing in mind particularly the initial manpower requirements of the Enterprise;

(b) Formulate the individual traineeships to be offered including their objectives, description of the training, eligibility requirements, duration and location as well as other requirements that may be attached to a particular traineeship;

(c) Open a Register incorporating all the necessary information on the traineeships being offered under the current schedule.

(d) Make a selection from the nominees entered in the Register and recommend their designation to the Preparatory Commission in respect of the available traineeships;

(e) Establish a standard format for the preparation of performance reports to be prepared pursuant to paragraph 2.9 of CRP.3;

(f) Evaluate performance reports in the event that designated persons are selected for further training;

(g) Prepare for the Preparatory Commission training certificates attesting to the completion of a traineeship and to the nature of the training given;

(h) Keep the Programme under review particularly with respect to established priorities, scheduling and financial implications, taking account also of the experience gained by both registered pioneer investors and trainees;

(i) Submit an annual progress report to the Preparatory Commission on the training provided, including information on all expenditures made under the Programme;

(j) Establish procedures as may be required for the administration of the Programme.

(k) Receive information and advice from Governments or institutions on relevant training provided by means of seminars and other forms of group training and inform the Preparatory Commission thereof.

1.4 Administrative and support services will be provided to the training panel by the United Nations Office for Ocean Affairs and the Law of the Sea. These services will include the processing of candidatures and, on behalf of the Preparatory Commission and the future Enterprise, the maintenance of personnel records on trainees.

Section 2. Nomination and selection of candidates

2.1 Following upon the establishment of the Register by the training panel, the United Nations Office for Ocean Affairs and the Law of the Sea will circulate notices to Governments, Signatories of the Convention, inviting nominations against the traineeships set forth in the Register.

2.2 Selection will be done according to the policies set forth in paragraph 2.7 of CRP.3 and shall take account of such factors as age and the language skills desired for a particular traineeship.

2.3 Persons selected from the Register by the training panel will be recommended for designation by the Preparatory Commission under paragraph 12 of Resolution II.

2.4 Nominating Governments will co-operate in facilitating the availability of the designated person at the time and for the period established in the traineeship. These Governments will also co-operate with the future Enterprise, in accordance with paragraph 2.10 of CRP.3, in making available the services of their nationals trained under the Programme .

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Section 3. Conditions and Requirements of traineeships.

3.1 The registered pioneer investors are responsible for the direct supervision of the training they provide.

3.2 Appropriate arrangements will be made for insurance to cover liability to third parties for damage to persons or property caused by trainees, as well as to cover sickness, accident, disability or death of a trainee, during the course of the training.

3.3 The trainees must:

(a) Carry out their training in the manner and within the period prescribed by the Preparatory Commission.

(b) Conduct themselves at all times in a manner compatible with their status as holders of Preparatory Commission traineeships. In the event of a failure to do so, the host Government may ask the Preparatory Commission to terminate the traineeship.

(c) Undertake, if so required by the registered pioneer investor concerned, to sign a confidentiality agreement and/or a non-competition agreement covering a reasonable period extending beyond the completion of the traineeship. *

(d) Obtain the written permission of the registered pioneer investor concerned to publish, during the course of his or her traineeship, articles relating to the training.

These conditions and requirements shall be specified by the Preparatory Commission when granting traineeships.

Section 4. Administrative arrangements

4.1 Trainees are required to undergo a thorough medical examination upon notice of their designation and a further examination, if more than four months have elapsed prior to the commencement of the training.

4.2 Appropriate arrangements will be made with respect to:

(a) The travel of trainees;

(b) The living expenses of the trainees and any other incidental costs associated with the traineeship;

(c) Medical insurance coverage.

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* The duration of each agreement will be determined following consultations between the Preparatory Commission and the registered pioneer investor concerned.

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4.3 The Government of the trainee is responsible for assistance in securing the necessary passports and visas and the receiving Government will also co-operate to this end.

The Ad Hoc Working Group on Training also recommends to Special Commission 2 that the following elements be added to the Policies set forth in document LOS/PCN/SCN.2/1988/CRP.3, namely:

> Preparatory Commission traineeships will not, in principle, be awarded for the pursuit of academic studies leading to degrees or diplomas. Rather, they are intended to give persons the opportunity to extend their professional or technical knowledge and experience to areas applicable to future sea-bed mining and to acquaint them with advanced methods and techniques currently used by registered pioneer investors.
>
> As appropriate, designated trainees may undergo more than one period of training and may also receive training from more than one registered pioneer investor.
>
> Where training or a component of the training provided is to be undertaken in universities or research institutions, these must be widely recognized in the country concerned.

/...

LOS/PCN/SCN.2/1990/CRP.5
15 March 1990

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEA-BED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2
Kingston, Jamaica, 5-30 March 1990

SUGGESTIONS OF THE CHAIRMAN TO FACILITATE DISCUSSION OF TRANSITIONAL ARRANGEMENTS FOR THE ENTERPRISE

I. Purpose of Transitional Arrangements

The Enterprise is established to be the operational arm of the Authority. However, a hiatus may occur between the time of entry into force of the Convention and the time when the viability of sea-bed mining is established with sufficient certainty to warrant the commencement of project planning and development by the Enterprise. This possible hiatus can be defined as the pre-operational period, affecting the Authority generally and the Enterprise specifically. For such a case, a special institutional arrangement is indicated for the Enterprise. It is to be considered whether this should allow for evolution within the transitional, pre-operational period itself. 1/

Furthermore, it is also recognized that even in the absence of a notable gap between entry into force and the establishment of sea-bed mining viability, the Enterprise must be allowed to evolve from an initial nucleus or core, particularly considering that its structure and organization will largely be a reflection of the operational option it adopts for its first venture.

In accordance with resolution I, it is the mandate of Special Commission 2 "to take all measures necessary for the early entry into effective operation of the Enterprise". It is therefore in keeping with this mandate that the Special Commission recommend to the Preparatory Commission transitional measures designed to ensure that there is no comparable hiatus in the evolution of the Enterprise as an institution.

The purpose of the following Transitional Arrangements for the Enterprise may be described thus:

a) to generally ensure the continuity of the work initiated by the Preparatory Commission, introducing modifications and additions as required;

b) to provide a focus within the Authority for the collection and analysis of all information and data pertinent to the development of the sea-bed mining industry;

c) to provide expert advice on the scientific, technical and economic aspects of the Authority's policies and programmes relating to the Enterprise;

/...

d) to provide a mechanism for the implementation of the Training Programme for the Enterprise, initiated by the Preparatory Commission.

II. Functions to be performed under the Transitional Arrangements 2/

1. The basic function to be performed over the period postulated is the monitoring of and reporting on all developments in, or affecting the sea-bed mining sector. This will include *inter alia*:

a) regular analysis of world market conditions and metal prices, trends and projections therein;

b) collection of information on and evaluation of technological developments;

c) assessment of the state of knowledge of deep-sea environments and possible effects of anthropogenic activities thereon.

The performance of this general function would require a close co-operative relationship with entities engaged in surveying and prospecting or other activities analagous to "pioneer activities", as well as national institutions engaged in relevant research and development activities. Equally, it would entail close co-operation with a number of international organizations, such as UNCTAD, UNESCO/IOC and UNEP, as well as the United Nations itself.

2. Another function which could be undertaken in the earliest stage would be the elaboration of options available to the Enterprise (as first attempted in WP.5 and its Add.1). This would also in time entail detailed studies of such aspects as:

a) the availability of capital from financial markets;

b) the particular requirements and implications of a joint venture approach to operations.

Studies of options may in turn permit work to begin in the transitional period on the formulation of operational strategies for sea-bed mining activities by the Enterprise.

3. A third pre-operational function would relate specifically to areas reserved for the Authority. Available information and data should be studied and compared in order to determine which reserved area would call for priority attention for further exploration and project development for the Enterprise.

4. Finally it will be necessary in the same period to elaborate a managerial policy on which basis the rules and regulations for Enterprise administration can then be formulated.

/...

III. Status and structure of the institutional arrangement

It is first to be established whether it is better to conceive of one, sufficiently uniform pre-operational stage or whether that period can be further broken down in the interests of efficiency and economy.

Indeed, the discussions over the past several years have not resolved the question as to whether it is desirable and necessary to elect the Governing Board and Director-General as one of the first actions of the Council and Assembly.

For the purpose of present discussions in the Special Commission, three options can be outlined:

1. A first option is rendered in Figure 2 of WP.15. The size of this nucleus Enterprise would follow from the limited functions described in that Figure.

2. A second option, as proposed by the delegation of Brazil, is to substitute the Governing Board by the Authority and the Director-General and staff by an Enterprise Core Group. A variant of this option, as proposed by the delegation of the Soviet Union, is to create a Task Force, composed of experts from the staff of the Authority and experts from pioneer investors and developing countries.

3. Again with reference to Figure 2 of WP.15 and as proposed by various delegations, a third option is to elect a small Governing Board and appoint a Director to supervise a small group of experts. It may be noted that the suggestion has been made to select that small Governing Board from among the members of the Council.

Delegations at this session, have suggested that about 10 to 15 experts (staff as well as consultants) would be needed. 3/

Also to be discussed is the question of whether or not an administrative budget should be clearly earmarked for these Transitional Arrangements or whether the costs of pre-operational functions are subsumed under the Authority's budget.

IV. Rules applicable to the Transitional Arrangements

It is sufficient to note at this stage that rules and regulations needed during this period — which primarily relate to confidentiality and conflict of interests — will in any event be the subject of annotations to the provisions of WP.16. Moreover, the same subjects are under study elsewhere in the Preparatory Commission.

Notes

1/ As suggested in LOS/PCN/SCN.2/WP.15, para. 2, it may be preferable to use the expression "nucleus Enterprise" only when describing the initial structure following upon the election of the Governing Board and the selection of the

/...

Director-General. Both in WP.12 and WP.15, the Secretariat has pointed to the possibility of an even earlier phase where a clearly designated group of experts could work within the staff of the Authority or where an external advisory body could perform the functions required. In earlier working papers, the idea had been advanced of establishing such an advisory group of experts even before the first meeting of the Assembly. These various understandings as to the possible evolution of the Enterprise are summarized in Figure 1 of WP.15.

2/ As pointed out in WP.12, these pre-operational functions are of value to both the Authority and the Enterprise. Thus the Transitional Arrangements proposed by Special Commission 2 should make this point to the Preparatory Commission so that there is no duplication in staff effort.

3/ It can be noted that in WP.12, 4 to 6 experts were estimated as all that might be needed at the very initial stage.

LOS/PCN/SCN.2/1991/CRP.5/Add.1
27 February 1991

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEA-BED AUTHORITY
AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2
Ninth session
Kingston, Jamaica
25 February-22 March 1991

SUGGESTIONS OF THE CHAIRMAN TO FACILITATE DISCUSSION OF TRANSITIONAL ARRANGEMENTS FOR THE ENTERPRISE

Addendum

In section II, paragraph 1 (b), after "on" add the words "the availability of technology and trained manpower" and "the".

In section II, paragraph 1 add a new subparagraph (d).

(d) "assessment of criteria and data relating to prospecting and exploration."

In the second part of paragraph 1, after the word "function" add "should be based on the use of existing data and information and", and in the second sentence include "IBRD" in the list of institutions.

In the chapeau of paragraph 2 the second sentence should read "Subject to a decision by the competent organ of the Authority, this would also in time entail detailed studies of aspects such as:"

/...

LOS/PCN/SCN.2/1991/CRP.5/Add.2*
24 January 1992

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEABED AUTHORITY
AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2
Tenth session
Kingston, Jamaica
24 February-13 March 1992

SUGGESTIONS OF THE CHAIRMAN TO FACILITATE DISCUSSION OF TRANSITIONAL ARRANGEMENTS FOR THE ENTERPRISE

Addendum

Options 2 and 3 in Part III are replaced by the following texts:

"2. A second option is to substitute the Governing Board by the Authority and the Director-General by an interim Co-ordinator who will be entrusted with the performance of the early functions of the Enterprise until mining is about to begin.

"3. A third option is to elect a small interim Governing Board and appoint an interim Director-General to supervise a small group of experts."

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* Reissued for technical reasons.

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PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEABED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2
New York, 10-21 August 1992

RECOMMENDED ANNOTATIONS BY SPECIAL COMMISSION 2 ON THE SUGGESTIONS OF THE CHAIRMAN OF THE SPECIAL COMMISSION TO FACILITATE DISCUSSIONS ON TRANSITIONAL ARRANGEMENTS FOR THE ENTERPRISE

INTRODUCTION

1. The present paper contains the recommendations of Special Commission 2 to the Plenary of the Preparatory Commission on transitional measures that need to be taken to ensure that during the period between the time of entry into force of the Convention and the time when the viability of seabed mining is established (pre-operational period), there is no hiatus in the evolution of the Enterprise as an institution. It incorporates the annotations which were made to the suggestions of the Chairman to facilitate discussions on transitional arrangements during the pre-operational stage of the Enterprise, contained in documents LOS/PCN/SCN.2/1990/CRP.5 and addenda 1 and 2.

2. It should be recalled that at the end of the resumed fourth session (1986, New York) when it became clear that the prospects for seabed mining were unfavourable and that there was little likelihood of its coincidence with the entry into force of the Convention, the Special Commission modified its programme of work to include a consideration of a recommendation that would have special significance should delays in the projected start-up of seabed mining persist at the time of the establishment of the Enterprise.[1] Having initially envisaged its work as encompassing the full range of preparatory work needed to facilitate the implementation of the Convention and to assure the ability of the Enterprise "to keep pace" with registered pioneer investors, this realization, together with the uncertainties associated with when seabed mining would be commercially viable, resulted in a need for the Special Commission to focus its attention on, inter alia, those functions that could be justified as economically and technically necessary to keep pace with registered pioneer investors during this period.[2]

3. At the same session, it was proposed that a "nucleus" Enterprise could be recommended to the plenary of the Preparatory Commission to provide for continued pre-feasibility work. That "nucleus", it was further suggested, did not need to be a distinct entity at the beginning; rather, the Authority could provide it with the necessary expertise, covering expenses from the its own budget. It was also decided that the Special Commission would restrict the scope of its recommendations on operational options and confine itself, unless conditions changed, to those options that would better facilitate the start-up of operations, particularly joint ventures and leasing options.[3]

4. At the Special Commission's request, document LOS/PCN/SCN.2/WP.12 "A nucleus Enterprise" was prepared by the secretariat and discussed by the Special Commission during the fifth session (1987, New York). In that working paper, the resemblance in terms of functions between the "nucleus Enterprise" and an earlier notion of a "core expert group" contained in document LOS/PCN/SCN.2/WP.7 - "Development of an ad hoc expert core group for the Enterprise to assist the Preparatory Commission" was noted. LOS/PCN/SCN.2/WP.7 was prepared by the Secretariat in response to a request by the Special Commission for a composite paper that would draw upon an earlier working paper, LOS/PCN/SCN.2/WP.2 - "The Enterprise - start-up requirements and preparatory measures", and concern itself firstly, with an ad hoc expert core group to advise the Preparatory Commission in the discharge of its responsibilities under paragraph 12 of resolution II of the Convention and secondly, with the development and recruitment of an in-house expert team to advise the management of the Enterprise on policies relevant to the

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[1] LOS/PCN/L.40 of 4 September 1986.

[2] LOS/PCN/L.40 of 4 September 1986.

[3] LOS/PCN/L.40 of 4 September 1986.

acquisition of technology, corporate planning and possible operating strategies.[4]

5. The suggestions advanced in the Chairman's paper resulted from these earlier discussions, the working papers discussed above, as well as document LOS/PCN/SCN.2/WP.15, "Structure and Organization of the Enterprise."

6. The Special Commission undertook a paragraph-by-paragraph reading of LOS/PCN/SCN.2/1990/CRP.5 containing the suggestions advanced by the Chairman to facilitate discussions on transitional arrangements, with a view to reaching agreement on, inter alia, the purpose of transitional arrangement, the functions to be performed under transitional arrangements, the status and structure of the institutional arrangements and rules applicable to the transitional arrangements. In so doing, the Special Commission agreed that form must follow function.

7. In general, the Special Commission addressed the need to minimize the costs of the transitional arrangements to States Parties while at the same time safeguarding both the effective operation of the Enterprise and its ability to evolve in an orderly fashion, as circumstances dictate, into a viable participant in deep seabed mining.

PART I: PURPOSE OF TRANSITIONAL ARRANGEMENTS

1. The Enterprise is established to be the operational arm of the Authority. A hiatus may however occur between the time of entry into force of the Convention and the time when the viability of seabed mining is established with sufficient certainty to warrant the commencement of project planning and development by the Enterprise. This possible hiatus can be defined as the pre-operational period, affecting the Authority generally and the Enterprise specifically. For such a case, a special institutional arrangement is indicated for the Enterprise. It is to be considered whether this should allow for evolution within the transitional, pre-operational period itself.[5]

2. Furthermore, it is also recognized that even in the absence of a notable gap between entry into force and the establishment of seabed mining viability, the Enterprise must be allowed to evolve from an initial nucleus or core, particularly considering that its structure and organization will largely be a reflection of the operational option it adopts for its first venture.

3. In accordance with resolution I, it is the mandate of Special Commission 2 "to take all measures necessary for the early entry into effective operation of the Enterprise". It is therefore in keeping with this mandate that the Special Commission recommends to the Preparatory Commission transitional

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[4] LOS/PCN/L.10, paragraph 13(c) of 4 September 1984.

[5] As suggested in LOS/PCN/SCN.2/WP.15, paragraph 2, it may be preferable to use the expression "nucleus Enterprise" only when describing the initial structure following upon the election of the Governing Board and the selection of the Director-General. Both in WP.12 and WP.15, the Secretariat has pointed tot he possibility of an even earlier phase where a clearly designated group of experts could work within the staff of the Authority or where an external advisory body could perform the functions required. In earlier working papers, the idea had been advanced of establishing such an advisory group of experts even before the first meeting of the Assembly. These various understandings as to the possible evolution of the enterprise are summarized in Figure 1 of WP.15.

measures designed to ensure that there is no comparable hiatus in the evolution of the Enterprise as an institution.

4. The purpose of the following Transitional Arrangements for the Enterprise may be described thus:

(a) to generally ensure the continuity of the work initiated by the Preparatory Commission, introducing modifications and additions as required;

(b) to provide a focus within the Authority for the collection and analysis of all information and data pertinent to the development of the seabed mining industry;

(c) to provide expert advice on the scientific, technical and economic aspects of the Authority's policies and programmes relating to the Enterprise;

(d) to provide a mechanism for the implementation of the Training Programme for the Enterprise, initiated by the Preparatory Commission.

ANNOTATION

The view was expressed that although the Chairman's paper depicted the Enterprise as evolving from an initial nucleus or core, this did not however imply a separate form. It was proposed that the core be subsumed under one of the organs of the Authority. Another point of view was for the Enterprise to be set up as a separate entity and not to be integrated in one of the organs of the Authority. It was concluded that since the language used in LOS/PCN/SCN.2/1990/CRP.5 was ambiguous and left the question open, it enabled the authority to decide at a later date what kind of structure there should be. There was general agreement on the purpose of the transitional arrangements as presented above.

PART II: FUNCTIONS TO BE PERFORMED UNDER THE TRANSITIONAL ARRANGEMENTS[6]

1. The basic function to be performed over the period postulated is the monitoring of and reporting on all developments in, or affecting the seabed mining sector. This will include, inter alia,

(a) regular analysis of world market conditions and metal prices, trends and projections therein;

(b) collection of information on the availability of technology and trained manpower and the evaluation of technological developments;

6/ As pointed out in WP.12, these pre-operational functions are of value to both the Authority and the Enterprise. Thus the transitional arrangements proposed by Special Commission 2 should make this point to the Preparatory Commission so that there is no duplication in staff effort.

(c) assessment of the state of knowledge of deep-sea environments and possible effects of anthropogenic activities thereon;

(d) assessment of criteria and data relating to prospecting and exploration.

The performance of this general function should be based on the use of existing data and information and would require a close co-operative relationship with entities engaged in surveying and prospecting or other activities analogous to "pioneer activities", as well as national institutions engaged in relevant research and development activities. Equally, it would entail close co-operation with a number of international organizations, such as UNCTAD, IBRD, UNESCO/IOC and UNEP, as well as the United Nations itself.

2. Another function which could, if appropriate, be undertaken at an early stage would be the elaboration of options available to the Enterprise (as first attempted in WP.6 and its Add.1). Subject to a decision by the competent organ of the Authority, this would also in time entail detailed studies of such aspects as:

(a) the availability of capital from financial markets;

(b) the particular requirements and implications of a joint venture approach to operations.

Studies of options may in turn permit work to begin in the transitional period on the formulation of operational strategies for seabed mining activities by the Enterprise.

3. A third pre-operational function would relate specifically to areas reserved for the Authority. Available information and data should be studied and compared in order to determine which reserved area would call for priority attention for further exploration and project development for the Enterprise.

4. Finally it will be necessary to elaborate a managerial policy on which basis the rules and regulations for Enterprise administration can then be formulated.

ANNOTATION

There was basic agreement on the need for flexibility in the functions of the Enterprise during the pre-operational phase. On the subject of its monitoring and reporting function as contained in paragraph 1 of Part II, it was felt that the nucleus Enterprise need not carry out primary research in cases where information was already available. It was pointed out that the information on the world metal markets was available in institutions such as the International Bank for Reconstruction and Development (IBRD), the International Monetary Fund (IMF) and the United Nations Conference on Trade and Development (UNCTAD). It was also pointed out that information on new developments in seabed mining could be obtained from several organizations.

Some suggested that by introducing language that based the monitoring and reporting function on the use of existing data and information, the Enterprise would be placed in a strait-jacket because it would be unable to obtain the information required in areas where gaps existed. It was noted that it was ludicrous to think that the nucleus Enterprise would go out and do its own research when the information it sought was already available. It was pointed out that the original formulation contained in LOS/PCN/SCN.2/1990/CRP.5, on information and data, defined the principle

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required and that it expressly called for close cooperation between the Enterprise and international organizations referred to in the paper.

There was general agreement on the need to carry out the function contained in paragraph 1(a) of Part II during the early or initial stages of the pre-operational period.

There was also general agreement on the need to carry out the functions contained in paragraph 1(b) of Part III as modified in LOS/PCN/SCN.2/1990/CRP.5/Add.1 during the early or initial stages. The original formulation was as follows: "Collection of information on the evaluation of technological developments." The formulation agreed upon is as follows: "Collection of information on the availability of technology and trained manpower, and the evaluation of technological developments."

It was agreed that the function contained in paragraph 1(c) of Part II should be carried out in the early or initial stages of the pre-operational period. It was noted that this function , the collection of information on research regarding the environmental effects of seabed mining, would in any event be undertaken by the Authority.

A new function was agreed upon as paragraph 1(d). This new function was described as "the assessment of criteria and data relating to prospecting and exploration". It was generally agreed that this new function could be undertaken during the early or initial stages of the pre-operational period.

Although not included in LOS/PCN/SCN.2/1990/CRP.5 and its addenda 1 and 2 as a pre-operational function of the Enterprise, it was agreed that the harmonization and co-ordination of activities with respect to exploration and training prior to the entry into force of the Convention and in the period before seabed mining is about to begin, a consequence of the understandings reached with the registered pioneer investors by the Preparatory Commission, was a function that should be performed under the transitional arrangements.

There was agreement that the functions contained in paragraph 1 of Part II, as well as the additional functions of (i) the assessment of criteria and data relating to prospecting and exploration; and, (ii) the harmonization and co-ordination of activities with respect to exploration and training by the registered pioneer investors were functions to be undertaken during the early stages of the transitional arrangements.

With regard to the functions outlined in paragraph 2 of part II, it was pointed out that because seabed mining would not be viable for another 15 to 20 years, these functions were unnecessary during the early or initial stages of the pre-operational period. Some suggested that the manner in which these functions had been formulated reflected the fact that the pre-operational period was evolutionary. In this regard, it was pointed out that it was necessary to have an active Enterprise whose experts could, in due time, undertake the studies called for by these functions. It was noted that the studies would be relied upon and would permit the Enterprise to obtain capital from financial markets when the need arose. There was agreement that at some stage during the pre-operational period these functions would be necessary and that it would be for the competent organ of the Authority to decide when to carry them out.

With respect to paragraph 3 of Part II, it was pointed out that since the economic viability of seabed mining would only be ascertained in the distant future (15 to 20 years), this function should be carried out only when the viability of seabed mining has been established.

As to the elaboration of a managerial policy on which basis the rules and regulations for the Enterprise's administration can be formulated, as contained in paragraph 4 of Part II, it was noted that for any management policy for the Enterprise to be formulated, a decision regarding its overall corporate policy on operations (be it as a fully integrated structure where the Enterprise can mine on its own behalf or in a series of joint venture operations) would have to be made by the competent organ of the Authority.

PART III: STATUS AND STRUCTURE OF THE INSTITUTIONAL ARRANGEMENT

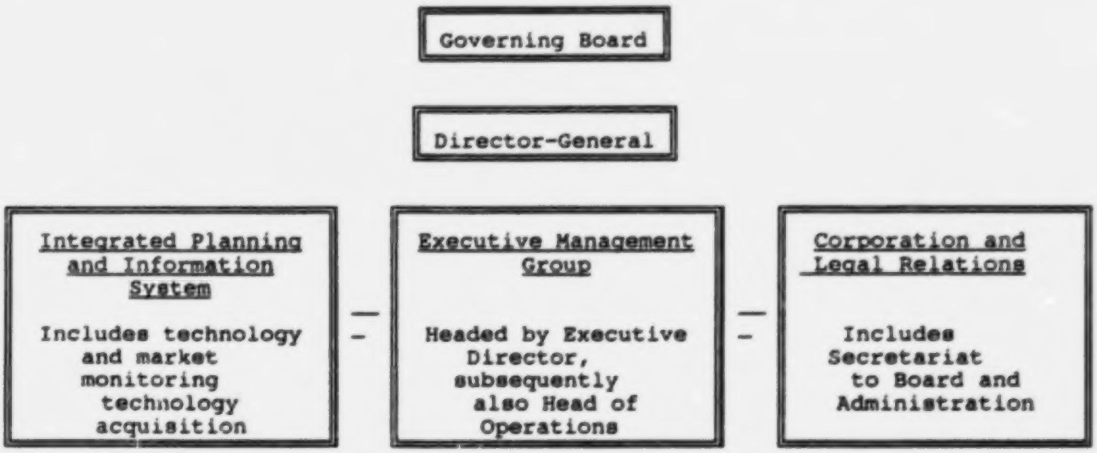
It is first to be established whether it is better to conceive of one, sufficiently uniform pre-operational stage or whether that period can be further broken down in the interests of efficiency and economy.

Indeed, the discussions over the past several years have not resolved the question as to whether it is desirable and necessary to elect the Governing Board and Director-General as one of the first actions of the Council and Assembly.

For the purpose of present discussions in the Special Commission, three options can be outlined:

1. A first option is rendered in Figure 2 of WP.15. The size of this nucleus Enterprise would follow from the limited functions described in that Figure.

The Nucleus Enterprise[7]


Governing Board
Director-General
Integrated Planning and Information System
Includes technology and market monitoring technology acquisition
Executive Management Group
Headed by Executive Director, subsequently also Head of Operations
Corporation and Legal Relations
Includes Secretariat to Board and Administration

2. A second option is to substitute the Governing Board by the Authority and the Director-General by an Interim Co-ordinator who will be entrusted with the performance of the early functions of the Enterprise until mining is about to begin.

7/ Figure 2 of LOS/PCN/SCN.2/WP.15 - Structure and Organization of the Enterprise. Working Paper by the Secretariat 25 February 1988.

/...

3. A third option is to elect a small interim Governing Board and appoint an interim Director-General to supervise a small group of experts.

Delegations at this session, have suggested that about 10 to 15 experts (staff as well as consultants) would be needed.[8]

Also to be discussed is the question of whether or not an administrative budget should be clearly earmarked for these Transitional Arrangements or whether the costs of pre-operational functions are to be subsumed under the Authority's budget.

ANNOTATION

It was pointed out that when Part XI of the United Nations Convention on the Law of the Sea was negotiated, the pre-operational period had not been foreseen and as a result no institutional arrangement had been provided for it. It was generally agreed that in the interests of economy, the pre-operational period could be broken down into an early or initial stage and subsequent stages as economic circumstances dictate. It was also agreed that the structure the of institutional arrangement during this period should evolve in the same way.

It was pointed out that during the early or initial stages of the pre-operational period, the functions to be performed under the institutional arrangement would consist of the monitoring and reporting functions contained in paragraph 1 of Part II, the assessment of criteria and data relating to prospecting and exploration, and the harmonization and co-ordination of activities with respect to exploration and training under the pioneer régime. It was also pointed out that seabed mining would not be viable for another 15 to 20 years. It was therefore agreed that the institutional arrangement required would not be the fully-fledged Enterprise.

The debate on whether or not it is desirable and necessary to elect the Governing Board and the Director-General of the Enterprise as one of the first actions of the Council and the Assembly was intrinsically linked to the discussions on the three options outlined in Part III, the status and structure of the institutional arrangement. These discussions were in turn linked to the need for the Special Commission to reach agreement on whether or not the Enterprise should be established at the early or initial stage of the pre-operational period.

In an effort to bring the debate on the status and structure of the institutional arrangement during the pre-operational period to a conclusion, informal consultations were convened between the representatives of the Group of 77 and the Group of 6. While both groups could not agree on the status and structure of the institutional arrangement at the early or initial stage of the pre-operational period, there was general agreement on the functions to be performed during this stage and subsequent stages, and on the need for an evolutionary approach where the functions outlined during the pre-operational period are implemented according to the dictates of the prevailing circumstances. The Group of 6 stated that there was no need to establish the Enterprise at the early stage of the pre-operational period. In this regard it stated its preference for an arrangement whereby the Governing Board of the Enterprise is substituted for by the Assembly and the Council and the Director-General by an interim coordinator. When commercial operations became feasible, then the members of the Governing Board and the Director-General would be elected. The interim coordinator would be assisted by experts who would be part of the Secretariat of the Authority. Together, they would perform the functions agreed upon by the Special Commission as being necessary during the early or initial stage of the pre-operational period and such other functions entrusted to them by the Council. The number of experts could be increased by decisions of the competent organs of the Authority in accordance with the volume of work. The remuneration of the interim coordinator and experts would be paid out of the administrative budget of the Authority. On the basis of developments in the seabed mining sector, the Council and the Assembly would decide when to set up the Enterprise and to elect the Governing Board and the Director-General.

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[8] It can be noted that in WP.12, 4 to 6 experts were estimated as all that might be needed at the very initial stage.

The Group of 77 stated its preference for the establishment of the Enterprise during the early or initial stage of the pre-operational period. There would be a small interim Governing Board and an interim Director-General. The policies of this nucleus Enterprise would reflect its autonomy and the state of affairs with respect to the prospects for seabed mining. The interim Director-General would be assisted by a small group of experts drawn from the Secretariat of the Authority. The interim Director-General and the experts would carry out the functions that had been agreed to in paragraph 1 of Part II. The number of experts would be increased according to the volume of work. The remuneration of the interim Director-General and experts would be paid out of the administrative budget of the Authority. The Assembly and Council would decide when to establish the fully-fledged Enterprise, enlarge the Governing Board and thus establish the Enterprise according to its constitution.

At the end of the Tenth session (1992, Kingston), the Special Commission agreed to make the following recommendation to the Assembly:

> "Pursuant to its mandate, Special Commission 2 had devoted considerable effort in grappling with the issue of the status and structure of the institutional arrangement during the pre-operational period. Most recently, this has occurred in CRP.5 and Addenda 1 and 2, which have been debated both formally and informally. What has emerged from these discussions is a widely held view that, in light of the prolonged delay in the development of deep seabed mining activities, it is unlikely that the Enterprise would be able to undertake operational activities for quite some time. Therefore, in the initial phase what will likely be needed is some initial institutional arrangements which could be activated as circumstances dictate. At the same time, it was recognized that the operations of the Enterprise should be based on sound commercial principles and that it should be autonomous and free from political domination.
>
> Just as the drafters of the Convention were unable successfully to forecast when commercially viable seabed mining would commence, we should also avoid a similar peril and not, at the present time, attempt to devise concrete operational structures for the Enterprise in the interim period. Let us remember that our task in Special Commission 2 is to provide our best advice, based on all available information, to the Assembly on how to deal with these unforeseen circumstances.
>
> The proposal, therefore, is that the Special Commission advise the Assembly to proceed on the basis of an evolutionary approach where the functions of the Enterprise, laid down in the Convention for its efficient operation, are filled and carried out according to the dictates of the prevailing circumstances. We could go as far as to say that the functions enumerated in Part II of CRP.5 represent our best judgement on the activities to be undertaken by the Enterprise in this interim period.

/...

> The Assembly will have to judge the best way in which these and any other functions are to be carried out and the functional mechanisms and initial status and structure of the Enterprise during the transitional period. Moreover, it should also be kept in mind that there is a general view on the need to minimize the costs to State Parties while at the same time safeguarding both the effective operation of the Enterprise and its ability to evolve in an orderly fashion, as circumstances dictate, into a viable participant in deep seabed mining."

The recommendation was agreed to by the Special Commission subject to conditions made by both the Group of 6 and the Group of 77. The Group of 6 agreement to the recommendation was on the understanding that when the Assembly took its decision, it would be by consensus. The Group of 77 agreement to the recommendation was subject to the condition that the initial structure proposed is understood to be for the pre-operational period only and that when the Assembly decides to enlarge the Enterprise, its decision would be taken in accordance with the modalities set forth in the Convention.

PART IV: RULES APPLICABLE TO THE TRANSITIONAL ARRANGEMENTS

It is sufficient to note at this stage that rules and regulations needed during this period -- which primarily relate to confidentiality and conflict of interests -- will in any event be the subject of annotations to the provisions of WP.16. Moreover, the same subjects are under study elsewhere in the Preparatory Commission.

ANNOTATION

It was agreed that reference be made to the results of the discussion on confidentiality as reflected in section 8, article 23 of LOS/PCN/SCN.2/L.8/Rev.1.

LOS/PCN/SCN.2/1992/CRP.5/Rev.2
7 December 1993

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE INTERNATIONAL
SEABED AUTHORITY AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2
New York, 10-21 August 1992

THE INITIAL OPERATIONS AND ADMINISTRATION OF THE ENTERPRISE

ANNOTATIONS MADE IN SPECIAL COMMISSION 2 ON THE SUGGESTIONS OF THE CHAIRMAN OF THE SPECIAL COMMISSION TO FACILITATE DISCUSSIONS ON TRANSITIONAL ARRANGEMENTS FOR THE ENTERPRISE

CONTENTS

		Page
INTRODUCTION		585
PART I.	PURPOSE OF THE TRANSITIONAL ARRANGEMENTS	586
PART II.	FUNCTIONS TO BE PERFORMED UNDER THE TRANSITIONAL ARRANGEMENTS	588
PART III.	STATUS AND STRUCTURE OF THE INSTITUTIONAL ARRANGEMENT	591
PART IV.	RULES APPLICABLE TO THE TRANSITIONAL ARRANGEMENTS	594

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INTRODUCTION

1. The present paper contains the annotations of Special Commission 2 to the plenary of the Preparatory Commission on transitional measures that need to be taken to ensure that during the period between the time of entry into force of the Convention and the time when the viability of seabed mining is established (pre-operational period), there is no hiatus in the evolution of the Enterprise as an institution. It incorporates the annotations which were made to the suggestions of the Chairman to facilitate discussions on transitional arrangements during the pre-operational stage of the Enterprise, contained in documents LOS/PCN/SCN.2/1990/CRP.5 and Add.1 and 2.

2. It should be recalled that at the end of the resumed fourth session (1986, New York) when it became clear that the prospects for seabed mining were unfavourable and that there was little likelihood of its coincidence with the entry into force of the Convention, the Special Commission modified its programme of work to include a consideration of a recommendation that would have special significance should delays in the projected start-up of seabed mining persist at the time of the establishment of the Enterprise. 1/ Having initially envisaged its work as encompassing the full range of preparatory work needed to facilitate the implementation of the Convention and to assure the ability of the Enterprise "to keep pace" with registered pioneer investors, this realization, together with the uncertainties associated with seabed mining would be commercially viable, resulted in a need for the Special Commission to focus its attention, inter alia, on those functions that could be justified as economically and technically necessary to keep pace with registered pioneer investors during this period. 2/

3. At the same session, it was proposed that a "nucleus" Enterprise could be recommended to the plenary of the Preparatory Commission to provide for continued pre-feasibility work. That "nucleus", it was further suggested, did not need to be a distinct entity at the beginning; rather, the Authority could provide it with the necessary expertise, covering expenses from its own budget. It was also decided that the Special Commission would restrict the scope of its recommendations on operational options and confine itself, unless conditions changed, to those options that would better facilitate the start-up of operations, particularly joint ventures and leasing options. 3/

4. At the Special Commission's request, document LOS/PCN/SCN.2/WP.12, "A nucleus Enterprise", was prepared by the Secretariat and discussed by the Special Commission during the fifth session (1987, New York). In that working paper, the resemblance in terms of functions between the "nucleus Enterprise" and an earlier notion of a "core expert group" contained in document LOS/PCN/SCN.2/WP.7 - "Development of an ad hoc expert core group for the

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1/ LOS/PCN/L.40 of 4 September 1986.

2/ Ibid.

3/ Ibid.

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Enterprise to assist the Preparatory Commission", was noted. LOS/PCN/SCN.2/WP.7 was prepared by the Secretariat in response to a request by the Special Commission for a composite paper that would draw upon an earlier working paper, LOS/PCN/SCN.2/WP.2 - "The Enterprise - start-up requirements and preparatory measures", and concern itself, firstly, with an ad hoc expert core group to advise the Preparatory Commission in the discharge of its responsibilities under paragraph 12 of resolution II of the Convention, and secondly, with the development and recruitment of an in-house expert team to advise the management of the Enterprise on policies relevant to the acquisition of technology, corporate planning and possible operating strategies. 4/

5. The suggestions advanced in the Chairman's paper resulted from these earlier discussions, the working papers discussed above, as well as document LOS/PCN/SCN.2/WP.15, "Structure and organization of the Enterprise".

6. The Special Commission undertook a paragraph-by-paragraph reading of LOS/PCN/SCN.2/1990/CRP.5 containing the suggestions advanced by the Chairman to facilitate discussions on transitional arrangements, with a view to reaching agreement, inter alia, on the purpose of transitional arrangements, the functions to be performed under transitional arrangements, the status and structure of the institutional arrangements and rules applicable to the transitional arrangements. In so doing, the Special Commission agreed that form must follow function.

7. In general, the Special Commission addressed the need to minimize the costs of the transitional arrangements to States Parties while at the same time safeguarding both the effective operation of the Enterprise and its ability to evolve in an orderly fashion, as circumstances dictate, into a viable participant in deep seabed mining.

Part I. PURPOSE OF THE TRANSITIONAL ARRANGEMENTS

1. The Enterprise is established to be the operational arm of the Authority. A hiatus may however occur between the time of entry into force of the Convention and the time when the viability of seabed mining is established with sufficient certainty to warrant the commencement of project planning and development by the Enterprise. This possible hiatus can be defined as the pre-operational period, affecting the Authority generally and the Enterprise specifically. For such a case, a special institutional arrangement is indicated

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4/ LOS/PCN/L.10, para. 13 (c) of 4 September 1984.

for the Enterprise. It is to be considered whether this should allow for evolution within the transitional, pre-operational period itself. 5/

2. Furthermore, it is also recognized that even in the absence of a notable gap between entry into force and the establishment of seabed mining viability, the Enterprise must be allowed to evolve from an initial nucleus or core, particularly considering that its structure and organization will largely be a reflection of the operational option it adopts for its first venture.

3. In accordance with resolution I, it is the mandate of Special Commission 2 "to take all measures necessary for the early entry into effective operation of the Enterprise". It is therefore in keeping with this mandate that the Special Commission recommends to the Preparatory Commission transitional measures designed to ensure that there is no comparable hiatus in the evolution of the Enterprise as an institution.

4. The purpose of the following transitional arrangements for the Enterprise may be described thus:

(a) To generally ensure the continuity of the work initiated by the Preparatory Commission, introducing modifications and additions as required;

(b) To provide a focus within the Authority for the collection and analysis of all information and data pertinent to the development of the seabed mining industry;

(c) To provide expert advice on the scientific, technical and economic aspects of the Authority's policies and programmes relating to the Enterprise;

(d) To provide a mechanism for the implementation of the Training Programme for the Enterprise, initiated by the Preparatory Commission.

Annotation

The view was expressed that although the Chairman's paper depicted the Enterprise as evolving from an initial nucleus or core, this did not however imply a separate form. It was proposed that the core be subsumed under one of the organs of the Authority. Another point of view was for the Enterprise to be set up as a separate entity and not to be integrated in one of the organs of the

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5/ As suggested in LOS/PCN/SCN.2/WP.15, para. 2, it may be preferable to use the expression "nucleus Enterprise" only when describing the initial structure following upon the election of the Governing Board and the selection of the Director-General. Both in WP.12 and WP.15, the Secretariat has pointed to the possibility of an even earlier phase where a clearly designated group of experts could work within the staff of the Authority or where an external advisory body could perform the functions required. In earlier working papers, the idea had been advanced of establishing such an advisory group of experts even before the first meeting of the Assembly. These various understandings as to the possible evolution of the Enterprise are summarized in figure 1 of WP.15.

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Authority. It was concluded that since the language used in LOS/PCN/SCN.2/1990/CRP.5 was ambiguous and left the question open, it enabled the Authority to decide at a later date what kind of structure there should be. There was general agreement on the purpose of the transitional arrangements as presented above.

Part II. FUNCTIONS TO BE PERFORMED UNDER THE TRANSITIONAL ARRANGEMENTS 6/

1. The basic function to be performed over the period postulated is the monitoring of and reporting on all developments in, or affecting the seabed mining sector. This will include, inter alia:

(a) Regular analysis of world market conditions and metal prices, trends and projections therein;

(b) Collection of information on the availability of technology and trained manpower and the evaluation of technological developments;

(c) Assessment of the state of knowledge of deep-sea environments and possible effects of anthropogenic activities thereon;

(d) Assessment of criteria and data relating to prospecting and exploration.

The performance of this general function should be based on the use of existing data and information and would require a close cooperative relationship with entities engaged in surveying and prospecting or other activities analogous to "pioneer activities", as well as national institutions engaged in relevant research-and-development activities. Equally, it would entail close cooperation with a number of international organizations, such as the United Nations Conference on Trade and Development (UNCTAD), the International Bank for Reconstruction and Development (IBRD), the United Nations Educational, Scientific and Cultural Organization (UNESCO)/Intergovernmental Oceanographic Commission (IOC) and the United Nations Environment Programme (UNEP), as well as the United Nations itself.

2. Another function which could, if appropriate, be undertaken at an early stage would be the elaboration of options available to the Enterprise (as first attempted in WP.6 and Add.1). Subject to a decision by the competent organ of the Authority, this would also in time entail detailed studies of such aspects as:

(a) The availability of capital from financial markets;

6/ As pointed out in WP.12, these pre-operational functions are of value to both the Authority and the Enterprise. Thus the transitional arrangements proposed by Special Commission 2 should make this point to the Preparatory Commission so that there is no duplication in staff effort.

(b) The particular requirements and implications of a joint venture approach to operations.

Studies of options may in turn permit work to begin in the transitional period on the formulation of operational strategies for seabed mining activities by the Enterprise.

3. A third pre-operational function would relate specifically to areas reserved for the Authority. Available information and data should be studied and compared in order to determine which reserved area would call for priority attention for further exploration and project development for the Enterprise.

4. Finally, it will be necessary to elaborate a managerial policy on which basis the rules and regulations for the administration of the Enterprise can then be formulated.

Annotation

There was basic agreement on the need for flexibility in the functions of the Enterprise during the pre-operational phase. On the subject of its monitoring and reporting function as contained in paragraph 1 of Part II, it was felt that the nucleus Enterprise need not carry out primary research in cases where information was already available. It was pointed out that the information on the world metal markets was available in institutions such as the International Bank for Reconstruction and Development (IBRD), the International Monetary Fund (IMF) and the United Nations Conference on Trade and Development (UNCTAD). It was also pointed out that information on new developments in seabed mining could be obtained from several organizations.

Some suggested that by introducing language that based the monitoring and reporting function on the use of existing data and information, the Enterprise would be placed in a strait-jacket because it would be unable to obtain the information required in areas where gaps existed. It was noted that it was ludicrous to think that the nucleus Enterprise would go out and do its own research when the information it sought was already available. It was pointed out that the original formulation contained in LOS/PCN/SCN.2/1990/CRP.5, on information and data, defined the principle required and that it expressly called for close cooperation between the Enterprise and international organizations referred to in the paper.

There was general agreement on the need to carry out the function contained in paragraph 1 (a) of Part II during the early or initial stages of the pre-operational period.

There was also general agreement on the need to carry out the functions contained in paragraph 1 (b) of Part III as modified in LOS/PCN/SCN.2/1990/CRP.5/Add.1 during the early or initial stages. The original formulation was as follows: "Collection of information on the evaluation of technological developments". The formulation agreed upon is as follows: "Collection of information on the availability of technology and trained manpower, and the evaluation of technological development".

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It was agreed that the function contained in paragraph 1 (c) of Part II should be carried out in the early or initial stages of the pre-operational period. It was noted that this function, the collection of information on research regarding the environmental effects of seabed mining, would in any event be undertaken by the Authority.

A new function was agreed upon as paragraph 1 (d). This new function was described as "the assessment of criteria and data relating to prospecting and exploration". It was generally agreed that this new function could be undertaken during the early or initial stages of the pre-operational period.

Although not included in LOS/PCN/SCN.2/1990/CRP.5 and Add.1 and 2 as a pre-operational function of the Enterprise, it was agreed that the harmonization and coordination of activities with respect to exploration and training prior to the entry into force of the Convention and in the period before seabed mining is about to begin, a consequence of the understandings reached with the registered pioneer investors by the Preparatory Commission, was a function that should be performed under the transitional arrangements.

There was agreement that the functions contained in paragraph 1 of Part II, as well as the additional functions of (i) the assessment of criteria and data relating to prospecting and exploration and (ii) the harmonization and coordination of activities with respect to exploration and training by the registered pioneer investors were functions to be undertaken during the early stages of the transitional arrangements.

With regard to the functions outlined in paragraph 2 of Part II, it was pointed out that because seabed mining would not be viable for another 15 to 20 years, these functions were unnecessary during the early or initial stages of the pre-operational period. Some suggested that the manner in which these functions had been formulated reflected the fact that the pre-operational period was evolutionary. In this regard, it was pointed out that it was necessary to have an active Enterprise whose experts could, in due time, undertake the studies called for by these functions. It was noted that the studies would be relied upon and would permit the Enterprise to obtain capital from financial markets when the need arose. There was agreement that at some stage during the pre-operational period these functions would be necessary and that it would be for the competent organ of the Authority to decide when to carry them out.

With respect to paragraph 3 of Part II, it was pointed out that since the economic viability of seabed mining would only be ascertained in the distant future (15 to 20 years), this function should be carried out only when the viability of seabed mining had been established.

As to the elaboration of a managerial policy on which basis the rules and regulations for the Enterprises's administration can be formulated, as contained in paragraph 4 of Part II, it was noted that for any management policy for the Enterprise to be formulated, a decision regarding its overall corporate policy on operations (be it as a fully integrated structure where the Enterprise can mine on its own behalf or in a series of joint-venture operations) would have to be made by the competent organ of the Authority.

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Part III. STATUS AND STRUCTURE OF THE INSTITUTIONAL ARRANGEMENT

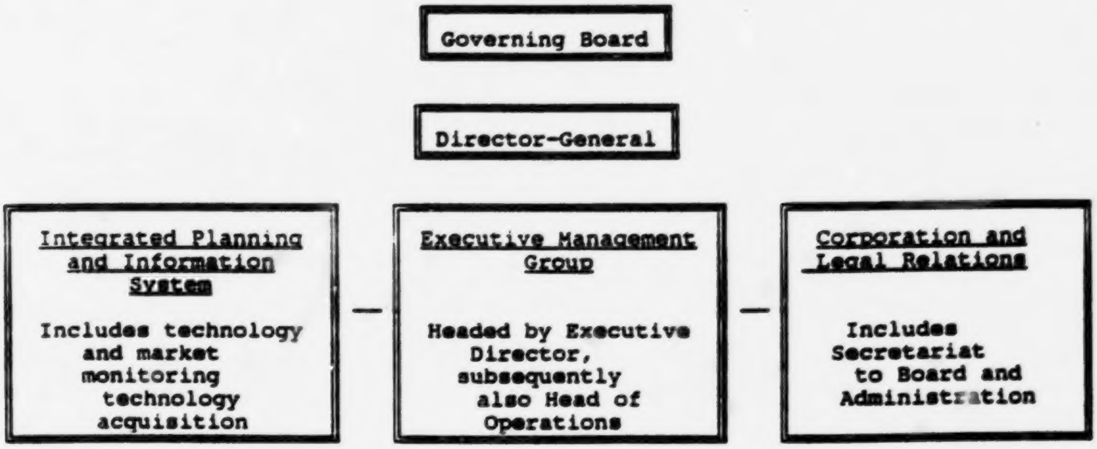
It is first to be established whether it is better to conceive of one sufficiently uniform pre-operational stage or whether that period can be further broken down in the interests of efficiency and economy.

Indeed, the discussions over the past several years have not resolved the question as to whether it is desirable and necessary to elect the Governing Board and Director-General as one of the first actions of the Council and Assembly.

For the purpose of the present discussions in the Special Commission, three options can be outlined:

1. A first option is rendered in figure 2 of WP.15. The size of this nucleus Enterprise would follow from the limited functions described in that figure.

The nucleus Enterprise 7/


Governing Board
Director-General
Integrated Planning and Information System
Includes technology and market monitoring technology acquisition
Executive Management Group
Headed by Executive Director, subsequently also Head of Operations
Corporation and Legal Relations
Includes Secretariat to Board and Administration

2. A second option is to substitute the Governing Board by the Authority and the Director-General by an Interim Coordinator who will be entrusted with the performance of the early functions of the Enterprise until mining is about to begin.

3. A third option is to elect a small interim Governing Board and appoint an interim Director-General to supervise a small group of experts.

7/ Figure 2 of LOS/PCN/SCN.2/WP.15 - "Structure and organization of the Enterprise": working paper by the Secretariat, dated 25 February 1988.

Delegations at the current session have suggested that about 10 to 15 experts (staff as well as consultants) would be needed. 8/

Also to be discussed is the question of whether or not an administrative budget should be clearly earmarked for these transitional arrangements or whether the costs of pre-operational functions are to be subsumed under the Authority's budget.

Annotation

It was pointed out that when Part XI of the United Nations Convention on the Law of the Sea was negotiated, the pre-operational period had not been foreseen and as a result no institutional arrangement had been provided for it. It was generally agreed that in the interests of economy, the pre-operational period could be broken down into an early or initial stage and subsequent stages as economic circumstances dictated. It was also agreed that the structure of the institutional arrangement during this period should evolve in the same way.

It was pointed out that during the early or initial stages of the pre-operational period, the functions to be performed under the institutional arrangement would consist of the monitoring and reporting functions contained in paragraph 1 of the Part II, the assessment of criteria and data relating to prospecting and exploration, and the harmonization and coordination of activities with respect to exploration and training under the pioneer regime. It was also pointed out that seabed mining would not be viable for another 15 to 20 years. It was therefore agreed that the institutional arrangement required would not be the fully fledged Enterprise.

The debate on whether or not it was desirable and necessary to elect the Governing Board and the Director-General of the Enterprise as one of the first actions of the Council and the Assembly was intrinsically linked to the discussions on the three options outlined in Part III, the status and structure of the institutional arrangement. These discussions were in turn linked to the need for the Special Commission to reach agreement on whether or not the Enterprise should be established at the early or initial stage of the pre-operational period.

In an effort to bring the debate on the status and structure of the institutional arrangement during the pre-operational period to a conclusion, informal consultations were convened between the representatives of the Group of 77 and the Group of 6. While both groups could not agree on the status and structure of the institutional arrangement at the early or initial stage of the pre-operational period, there was general agreement on the functions to be performed during this stage and subsequent stages, and on the need for an evolutionary approach where the functions outlined during the pre-operational period were implemented according to the dictates of the prevailing circumstances. The Group of 6 stated that there was no need to establish the

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8/ It may be noted that in WP.12, four to six experts were estimated as all that might be needed at the very initial stage.

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Enterprise at the early stage of the pre-operational period. In this regard it stated its preference for an arrangement whereby the Governing Board of the Enterprise was substituted for by the Assembly and the Council and the Director-General by an interim coordinator. When commercial operations became feasible, then the members of the Governing Board and the Director-General would be elected. The interim coordinator would be assisted by experts who would be part of the Secretariat of the Authority. Together, they would perform the functions agreed upon by the Special Commission as being necessary during the early or initial stage of the pre-operational period and such other functions entrusted to them by the Council. The number of experts could be increased by decisions of the competent organs of the Authority in accordance with the volume of work. The remuneration of the interim coordinator and experts would be paid out of the administrative budget of the Authority. On the basis of developments in the seabed mining sector, the Council and the Assembly would decide when to set up the Enterprise and to elect the Governing Board and the Director-General.

The Group of 77 stated its preference for the establishment of the Enterprise during the early or initial stage of the pre-operational period. There would be a small interim Governing Board and an interim Director-General. The policies of this nucleus Enterprise would reflect its autonomy and the state of affairs with respect to the prospects for seabed mining. The interim Director-General would be assisted by a small group of experts drawn from the Secretariat of the Authority. The interim Director-General and the experts would carry out the functions that had been agreed to in paragraph 1 of Part II. The number of experts would be increased according to the volume of work. The remuneration of the interim Director-General and experts would be paid out of the administrative budget of the Authority. The Assembly and Council would decide when to establish the fully fledged Enterprise, enlarge the Governing Board and thus establish the Enterprise according to its constitution.

At the end of the tenth session (1992, Kingston), the Special Commission agreed to make the following recommendation to the Assembly:

> "Pursuant to its mandate, Special Commission 2 had devoted considerable effort in grappling with the issue of the status and structure of the institutional arrangement during the pre-operational period. Most recently, this has occurred in CRP.5 and Addenda 1 and 2, which have been debated both formally and informally. What has emerged from these discussions is a widely held view that, in the light of the prolonged delay in the development of deep seabed mining activities, it is unlikely that the Enterprise would be able to undertake operational activities for quite some time. Therefore, in the initial phase what will likely be needed is some initial institutional arrangements which could be activated as circumstances dictate. At the same time, it was recognized that the operations of the Enterprise should be based on sound commercial principles and that it should be autonomous and free from political domination.
>
> "Just as the drafters of the Convention were unable successfully to forecast when commercially viable seabed mining would commence, we should also avoid a similar peril and not, at the present time, attempt to devise concrete operational structures for the Enterprise in the interim period. Let us remember that our task in Special Commission 2 is to provide our

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best advice, based on all available information, to the Assembly on how to deal with these unforeseen circumstances.

"The proposal, therefore, is that the Special Commission advise the Assembly to proceed on the basis of an evolutionary approach where the functions of the Enterprise, laid down in the Convention for its efficient operation, are filled and carried out according to the dictates of the prevailing circumstances. We could go as far as to say that the functions enumerated in Part II of CRP.5 represent our best judgement on the activities to be undertaken by the Enterprise in this interim period.

"The Assembly will have to judge the best way in which these and any other functions are to be carried out and the functional mechanisms and initial status and structure of the Enterprise during the transitional period. Moreover, it should also be kept in mind that there is a general view on the need to minimize the costs to States Parties while at the same time safeguarding both the effective operation of the Enterprise and its ability to evolve in an orderly fashion, as circumstances dictate, into a viable participant in deep seabed mining."

The recommendation was agreed to by the Special Commission subject to conditions made by both the Group of 6 and the Group of 77. The Group of 6 agreement to the recommendation was on the understanding that when the Assembly took its decision, it would be by consensus. The Group of 77 agreement to the recommendation was subject to the condition that the initial structure proposed is understood to be for the pre-operational period only and that when the Assembly decides to enlarge the Enterprise, its decision would be taken in accordance with the modalities set forth in the Convention.

Part IV. RULES APPLICABLE TO THE TRANSITIONAL ARRANGEMENTS

It is sufficient to note at this stage that rules and regulations needed during this period - which primarily relate to confidentiality and conflict of interests - will in any event be the subject of annotations to the provisions of WP.16. Moreover, the same subjects are under study elsewhere in the Preparatory Commission.

Annotation

It was agreed that reference be made to the results of the discussion on confidentiality as reflected in section 8, article 23, of LOS/PCN/SCN.2/L.8/Rev.1.

LOS/PCN/SCN.2/1992/CRP.6
17 August 1992

ORIGINAL: ENGLISH

PREPARATORY COMMISSION FOR THE
INTERNATIONAL SEABED AUTHORITY
AND FOR THE INTERNATIONAL
TRIBUNAL FOR THE LAW OF THE SEA
Special Commission 2
New York, 10-21 August 1992

DRAFT PROVISIONAL FINAL REPORT OF SPECIAL COMMISSION 2

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I. MANDATE OF THE SPECIAL COMMISSION

1. The Special Commission for the Enterprise, Special Commission 2, was established in accordance with resolution I, paragraph 8 of the United Nations Convention on the Law of the Sea. Under resolution I, paragraph 8, the Special Commission for the Enterprise is entrusted with the task of:

(a) Taking all measures necessary for the early entry into effective operation of the Enterprise; and

(b) Performing the functions referred to in paragraph 12 of resolution II.

2. Paragraph 12 of resolution II of the United Nations Convention on the Law of the Sea, in its chapeau establishes the objective of ensuring that the Enterprise is able to carry out activities in the Area in such a manner as to keep pace with States and other entities. To that end, it requires that

"(a) every registered pioneer investor shall:

(i) carry out exploration, at the request of the Commission, in the area reserved, pursuant to paragraph 3 in connection with its application, for activities in the Area by the Authority through the Enterprise or in association with developing States, on the basis that the costs so incurred plus interest thereon at the rate of 10 per cent per annum shall be reimbursed;

(ii) provide training at all levels for personnel designated by the Commission;

(iii) undertake before the entry into force of the Convention, to perform the obligations prescribed in the Convention relating to transfer of technology;

(b) every certifying State shall:

(i) ensure that the necessary funds are made available to the Enterprise in a timely manner in accordance with the Convention, upon its entry into force; and

/...

(ii) report periodically to the Commission on the activities carried out by it, by its entities or natural or juridical persons."

II. PROGRAMME OF WORK

3. The Special Commission commenced its work under the Chairmanship of Mr. Lennox Ballah of Trinidad and Tobago with the adoption of its programme of work contained in document LOS/PCN/SCN.2/1984/CRP.1 and decided to give first priority to its consideration of the application of paragraph 12 of resolution II, and consideration of the preparatory measures that could be undertaken in accordance with the provisions of that paragraph; secondly, to a consideration of the structure of the Enterprise and in particular, the structure and requirements for its start-up and establishment; and thirdly to an examination of operational options, beginning with an evaluation of the joint venture option for the initial operation of the Enterprise as follows:

(i) Application of resolution II, paragraph 12, including

    (a) Development of a training scheme

    (b) Other measures to be taken under paragraph 12.

(ii) Establishment of the organizational structure of the Enterprise

    (a) Draft rules of procedure of the Governing Board

    (b) Draft Staff Rules

    (c) Draft Financial Rules

    (d) Establishment of the principal office of the Enterprise

    (e) Administrative and financial arrangements

(iii) Development of policies and feasibility studies in preparation for the early entry into effective operation of the Enterprise:

    (a) Elaboration of operational options

    (b) Project formulation

    (c) Supplementary procedures for the conduct of operations

/...

(iv) Formulation of recommendations for the initial operation and administration of the Enterprise

(v) Other questions, including

  (a) Coordinative arrangements for dealing with matters relating also to the work of other bodies of the Preparatory Commission

  (b) Establishment of an information programme on seabed resource development, including in particular, an information system on technology suppliers.

4. Item (iv) in the programme of work was recognized as mostly being a distillation of the conclusions that would be reached in the course of work on items (i), (ii) and (iii). With regard to item (v), it was understood that the need for coordination with other bodies would be addressed as and when necessary, and that the requirement for an information programme on seabed resource development, as indicated in item (v)(b), would be identified in the course of the Special Commission's future work. 1/

5. The Special Commission initially envisaged its work as encompassing the full range of preparatory work needed to facilitate the implementation of the Convention and to assure the ability of the Enterprise "to keep pace" with registered pioneer investors, in the event that seabed mining was ready to commence at the time of entry into force of the Convention. It thus adopted a comprehensive approach which would allow it to produce a detailed set of generally applicable recommendations and draft rules as to the organizational structure, policies, management and operations of the Enterprise, as well as a set of distinct recommendations with respect to the initial operations and administration of the Enterprise, recognizing the need to allow for evolution. 2/ This approach also determined the scope and content of its initial working papers. 3/

6. As a result of the decision taken by the Preparatory Commission that the General Committee should act on its behalf as the executive organ for the administration of resolution II, the special preparatory functions set forth in paragraph 12 of resolution II with the exception of the development of a training scheme were dealt with outside Special Commission 2. 4/

7. It must be noted also that the likelihood of the entry into force of the Convention being coincidental with the economic viability of a seabed mining industry was increasingly questioned. This affected the approach adopted by the Special Commission and the priorities accorded to the different elements of its work. During the resumed fourth session (1986, New York),

when it became clear that the prospects for seabed mining were unfavourable and that there was little likelihood of its coincidence with the entry into force of the Convention, certain modifications in the programme of work of the Special Commission were introduced. Several of these modifications reflected a new understanding of the general scope and content of the recommendations that the Special Commission could most usefully make to ensure "early entry into effective operation of the Enterprise" (its mandate under resolution I) and its ability to keep pace with the activities of pioneer investors (its mandate under resolution II). Three sufficiently distinct sets of recommendations were therefore contemplated:

(a) Those that addressed the first operations of the Enterprise and that would necessarily need to take account of the economic conditions for seabed mining;

(b) Those that dealt with basic administrative, management and procedural matters, that would be unaffected by the timing of operations and that would permit the Enterprise to function as a distinct entity, without unnecessary delay; and,

(c) Those that addressed the implementation of paragraph 12 of resolution II and that may or may not be organically linked to recommendations on the first operation. 5/

8. Of particular note was the Special Commission's introduction of a special mechanism (the Chairman's ad hoc Advisory Group on Assumptions) to monitor economic factors pertinent to the question of seabed mining viability. That need, shared also by Special Commission 1, had not been envisaged at the outset. Also notable was its general conclusion that virtually any concrete recommendation it could make on both operational and organizational matters would need to be revised as and when economic prospects for mining improve. 6/

9. As a result, from 1986 to the present, the work of Special Commission 2 focussed on the following: development and establishment of a training programme; organizational structure of the Enterprise and consideration of a recommendation regarding a pre-operational Enterprise; operational options of the Enterprise including project feasibility analysis, an agreed set of working assumptions and the initial operation of the Enterprise.

II. Concise summary of the overall accomplishments of the Special Commission

1. Application of resolution II, paragraph 12

(a) Development of a training scheme

10. With respect to its mandated functions under resolution II, the Special Commission, from the beginning, paid special attention to the need to organize a training scheme. While the basic design of the training programme was grounded on the scope of the training obligation of the pioneer investors, Special Commission 2 began to introduce an important distinction in its work as between the formulation of basic planning guidelines and modalities for a training programme, and decisions as to its actual implementation.

11. An Ad Hoc Working Group on Training with a mandate to draft the principles, policies, guidelines and procedures for a Preparatory Commission training programme was established by the Special Commission during the fifth session of the Preparatory Commission (1987, Kingston). At the resumed sixth session (1988, New York), the Ad Hoc Working Group on Training submitted to the Special Commission document LOS/PCN/SCN.2/1988/CRP.3 entitled "Principles and Policies for a Training Programme to be instituted by the Preparatory Commission". At the seventh session (1989, Kingston), it submitted to the Special Commission document LOS/PCN/SCN.2/1989/CRP.4 entitled "Draft Guidelines and Procedures for the Implementation of the Training Programme". Special Commission 2 concluded that there was basic agreement on the documents and that they provided the basis for its work on training. 7/ Following a request by the Special Commission, these documents went through a few drafting changes to become document LOS/PCN/SCN.2/L.6/Rev.1, "Principles, Policies, Guidelines and Procedures for a Preparatory Commission Training Programme".

12. LOS/PCN/SCN.2/L.6/Rev.1 was adopted first by Special Commission 2 and then by the Preparatory Commission during the resumed seventh session (1989, New York). During the eighth session (1989, Kingston) the Preparatory Commission adopted LOS/PCN/SCN.2/L.7, "Implementation of the Preparatory Commission Training Programme. Recommendations of Special Commission 2".

13. During the ninth session (1992, Kingston), the Training Panel was constituted with 21 members selected on the basis of the principle of equitable geographical distribution and, including one expert from each of the registered pioneer investors. 8/ The Preparatory Commission appointed the Chairman of Special Commission 2 as an ex officio member of the Training Panel. The Panel held its first meeting during the resumed ninth session (1991, New York) and decided that

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traineeships should cover five engineering disciplines (chemical/metallurgical, electrical, electronic, mechanical and mining), marine geology, marine geophysics and marine ecology as set forth in LOS/PCN/BUR/R.9. Documents LOS/PCN/SCN.2/L.7 and LOS/PCN/BUR/R.9 are reproduced in annex 1 of this report.

14. At the tenth session (1992, Kingston), the Training Panel approved the training programmes offered by France and Japan (each of which was for three traineeships starting in November 1992 and May 1993 respectively). It established the minimal qualifications of applicants for the training programme, developed criteria for selecting candidates and approved a note verbale announcing the training programmes of France and Japan. 9/ The Training Panel met during the first week of the resumed tenth session (1992, New York). At this session, it selected six candidates for the programmes offered by Japan and France from sixty-seven applications and approved the revised training programmes offered by India and the Russian-Federation, both of which are to start in October 1993. The Training Panel is yet to consider the training programmes required of China on behalf of the China Ocean Mineral Resources Research and Development Association (COMRA) and Interoceanmetal Joint Organization (Bulgaria, Cuba, the Czech and Slovak Federal Republic and the Russian Federation). Additionally, since a number of technologically advanced States which may be interested in offering training programmes have yet to submit these programmes, the Training Panel will have to continue to meet in the future to review these programmes, and, following the receipt of candidates for these programmes, make a selection. It will also have to meet to review the actual training programmes and their results. 10/

(b) Other measures to be taken under paragraph 12

15. The other measures under paragraph 12 of resolution II required

(a) that every registered pioneer investor should:

- (i) carry out exploration, at the request of the Commission, in the area reserved for activities by the Authority through the Enterprise or in association with developing States, on the basis that the costs so incurred plus interest thereon at the rate of 10 per cent per annum shall be reimbursed;
- (ii) undertake before the entry into force of the Convention, to perform the obligations prescribed in the

Convention relating to transfer of technology;

(b) every certifying State should:

  (i) ensure that the necessary funds are made available to the Enterprise in a timely manner in accordance with the Convention, upon its entry into force; and

  (ii) report periodically to the Commission on the activities carried out by it, by its entities or natural or juridical persons.

16. As noted earlier, with the exception of the establishment of a training scheme, the special preparatory functions set forth above were assigned to the General Committee. The Special Commission did, however, note the important linkage between the exploration of the Authority's reserved area and the training programme and made a recommendation to take account of this linkage for the transitional pre-operational period (see Section III.4).

2. Establishment of the Organizational Structure of the Enterprise

17. As early as its initial exchange on the Enterprise's organizational structure and given its perception of present and predicted economic conditions, the Special Commission called for a pragmatic approach to planning for the "early entry into effective operation of the Enterprise" and stressed that the initial Enterprise might best be regarded as a nucleus establishment capable, however, of maturing quickly under favourable operating conditions. 11/

18. At the request of the Special Commission in 1984, document LOS/PCN/SCN.2/WP.2, entitled "The Enterprise - start-up requirements and preparatory measures", was prepared to facilitate its work in this regard. As a result of its discussion on this working paper, the Special Commission recognized the need to elaborate a possible structure and organization for the Enterprise that took into account the extent to which operational modalities would affect organizational matters, and also the need to establish the Enterprise with a minimal and flexible arrangement that would enable it to respond to favourable operating circumstances.

19. An outgrowth of the discussions of LOS/PCN/SCN.2/WP.2 was an additional request concerning the development of an expert team for the Enterprise and the process for facilitating their

recruitment by the Enterprise. Document LOS/PCN/SCN.2/WP.7, entitled "Development of an ad hoc expert core group for the Enterprise to assist the preparatory Commission", was prepared in response to this request. In 1986 (New York), the Special Commission requested a new working paper that would be useful in a discussion of an initial "nucleus" Enterprise should delays in the projected start-up of seabed mining persist at the time of the establishment of the Enterprise. A "nucleus" Enterprise would be recommended in order to provide for continued pre-feasibility work. 12/

20. The working paper prepared by the secretariat at the Special Commission's request, LOS/PCN/SCN.2/WP.12, entitled "A nucleus Enterprise", bore a resemblance, in terms of functions, to the earlier notion of a "core expert group" contained in document LOS/PCN/SCN.2/WP.7. The monitoring, evaluation and continued preparatory functions contained in the report that would need to be performed in the pre-feasibility period were generally accepted by the Special Commission. Also accepted was the necessity of keeping personnel and costs down to a minimum during that period. Some differences arose, however, as to the proper status that should be accorded such a "nucleus", pre-operational Enterprise.

21. Following these discussions, the Special Commission requested a working paper on the general framework provided in annex IV to the convention which contains the statute of the Enterprise to help it to focus on what the powers, functions and internal procedures of a nucleus Enterprise should be. 13/ The working paper LOS/PCN/SCN.2/WP.16 of 22 February 1989, entitled, "Provisions of the convention relating to the structure and organization of the Enterprise", proved to be a useful means of focusing attention on the constituent elements of the Enterprise, as well as a means of identifying those provisions of the Convention that required annotations. It also helped to identify those elements that would form the substance of transitional arrangements to deal with the pre-operational stage of the Enterprise. 14/

22. In its consideration of working paper LOS/PCN/SCN.2/WP.16, the Special Commission set as its purpose: to allow the Preparatory Commission to comment on provisions of the Convention in the interest of promoting reasonable interpretation; to suggest additional draft provisions to facilitate effective application; and to suggest additional draft rules on matters such as the confidentiality requirement, on which the Convention has no rule relating to the Enterprise. As a result of the discussion and comments made on LOS/PCN/SCN.2/WP.16, the Special Commission's final recommendations to the Plenary of the Preparatory Commission on the structure and organization of the Enterprise are contained in document LOS/PCN/SCN.2/L.8/Rev.1 of 14 August 1991, entitled "Recommended Annotations by Special

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Commission 2 on the Provisions of the Convention Relating to the Structure and Organization of the Enterprise". This document is reproduced in annex 2 of this report.

3. Development of policies and feasibility studies in preparation for the early entry into effective operation of the Enterprise.

(a) Elaboration of Operational Options/project formulation

23. From the first consideration of this topic, attention was focussed on the initial period, which was described in 1984 in LOS/PCN/SCN.2/WP.2, as beginning "under favourable conditions" in the third year, with the pre-investment stage of operations in the fifth year. At the same time, it was also recognized that there would be a critical period in the six months following entry into force, since it would be then that the financial situation would become clear and when registered pioneer investors would be anticipated to exercise their acquired rights.

24. Also evident from the beginning of its work, had been the Special Commission's recognition of the need to give priority attention to joint ventures as an operational option of the Enterprise, particularly for its first venture. 15/

25. The first discussions of the Enterprise's operations took place on the basis of LOS/PCN/SCN.2/WP.6 of 5 February 1985, which had been prepared in response to the Special Commission's request for a complete project profile for the Enterprise, as provided for in article 170 of the Convention. 16/ That working paper, entitled "Project profile of a deep seabed mining operation by the Enterprise", which relied for its data and methodology on pre-existing, readily available studies, concentrated on evaluating the options available to the Enterprise (i.e., joint ventures, leasing/service contracts, Enterprise as sole operator and mixes thereof according to the phase of work). In the end, these options are to be determined in accordance with financial and manpower requirements.

26. While that working paper was predicated on the underlying assumption of the perceived economic viability of seabed mining, questions were none the less raised as to the basic framework of the profile, particularly as to the parameters listed in its paragraph 20, and their reflection of present and predicted conditions in the minerals industry and markets. 17/

27. To demonstrate some of the issues involved, the delegation of Australia undertook a special study, incorporating more recent data and submitted it in document LOS/PCN/SCN.2/WP.10 of 14 January 1986, entitled "Economic viability of deep seabed mining of polymetallic nodules". That working paper gave a pessimistic assessment of the economic viability of seabed mining which was

attributed to the state of the metal markets. It stated that in the light of the prevailing economic trends, particularly the metal prices for cobalt, copper, manganese and nickel, increases in aggregate metal prices, to as high as twice their levels at March 1985, would be required to make the mining venture viable. It concluded that given the metal price outlook, deep seabed mining for polymetallic nodules was unlikely to be undertaken on a commercial basis for the foreseeable future.

(b) Chairman's Advisory Group on Assumptions

28. Consequent upon the discussion of LOS/PCN/SCN.2/WP.10, the Special Commission recognized the need to keep the matter of assumptions under review. It therefore created in 1986 (New York session) an Ad Hoc Group on Assumptions, later to become a permanent feature of the Special Commission's work. The Group was required to report regularly as to whether, in the light of the latest data, a new study updating LOS/PCN/SCN.2/WP.10 could be undertaken by the Government of Australia. At the resumed tenth session the Group submitted a comparative study of the Australian and French Models and concluded that neither of them yield the required discounted cash flow rate of return (DCFROR). The recommendations of the Special Commission with regard to continued work on assumptions is reproduced in annex 3 of this report.

(c) Initial operation of the Enterprise

29. From its first consideration of this topic, the Special Commission recognized the need to give priority attention to joint ventures as an operational option of the Enterprise, particularly for its first venture. The advantages of joint ventures from the viewpoint of practicality and minimization of risks were stressed, as were the advantages for both mining and processing, particularly with regard to transfer of technology and development of manpower. Nevertheless, it was agreed that the first option to be studied in detail was that of the Enterprise as sole operator of a fully integrated project.

(d) Sole operator

30. The initial working paper utilized by the Special Commission in its consideration of the operational option of the Enterprise as sole operator was LOS/PCN/SCN.2/WP.2, "The Enterprise, start-up requirements and preparatory measures." Consequent upon the discussions of LOS/PCN/SCN.2/WP.6 and its addendum 1 and Corr.1, and LOS/PCN/SCN.2/WP.10 and its addendum 1, the Special Commission decided that any concrete recommendation it drew on operational matters would need to be revised as and when economic prospects for mining improved. As a result, consideration of the Enterprise as sole operator in its initial operations was deferred. 18/

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(e) The Enterprise in a Joint Venture

31. Throughout its deliberations on operational options, preference was expressed by the Special Commission for the joint venture as the appropriate contractual device to ensure that the seabed is efficiently exploited. In this regard, a number of working papers were considered by the Special Commission. At the second session (1984, Kingston) a preliminary note on the Enterprise prepared by the secretariat of the Asian-African Legal Consultative Committee was presented to the Special Commission. At the same session, the delegation of Austria presented a proposal to establish a Joint Enterprise for Exploration, Research and Development in Ocean Mining (JEFERAD) contained in document LOS/PCN/SCN.2/L.2 and Add. 1.

32. LOS/PCN/SCN.2/WP.3, "Information note on elements of joint ventures" was requested by the Special Commission and considered by it during the resumed second session (1984, Geneva). This working paper outlined considerations relevant to the conclusion of joint venture agreements. LOS/PCN/SCN.2/WP.4, "Proposal on a joint venture - Proposals by the delegations of Belgium, France, Germany, Federal Republic of, Italy, Japan, the Netherlands and the United Kingdom of Great Britain and Northern Ireland" was also presented at the resumed second session. This working paper, while recognizing that no hard and fast criteria can be established for a successful joint venture agreement, noted the importance of allowing the Governing Board of the Enterprise sufficient flexibility when negotiating with prospective partners. It discussed some of the key elements for establishing a successful joint venture agreement based on a model agreement contained in document LOS/PCN/SCN.2/WP.5, "A model joint venture agreement for seabed mining - submitted by the delegation of the Federal Republic of Germany."

33. LOS/PCN/SCN.2/WP.5 contained a model agreement for establishing a joint venture between the Enterprise and national or transnational, private or State-owned companies or consortia. The model agreement was not meant to tie discussions down to the specific clauses contained therein, but rather to identify the issues that would have to be addressed and equitably solved if a mutually beneficial joint venture relationship was to be concluded between the concerned parties. At the request of the Special Commission, during the fifth session (1987, Kingston), the delegation of Colombia submitted document LOS/PCN/SCN.2/WP.4, "The International Venture." This study provided a further analysis of a joint venture between pioneer investors and the Enterprise, placing special emphasis on exploration, research and development, and the training of personnel.

34. At the resumed eighth session (1990, New York), the Special Commission began consideration of document LOS/PCN/SCN.2/WP.18, "Draft basic joint venture contract" and document

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LOS/PCN/SCN.2/WP.18/Add.1, "Draft basic joint venture contract - Explanatory memorandum" which were prepared by the secretariat to facilitate concrete discussions on joint ventures.

In introducing the working papers, the Special Representative of the Secretary-General recalled that during the meetings of the Seabed Committee and the Third Conference on the Law of the Sea, considerable importance had been given to the idea of a joint venture as the sole mechanism for the development of the resources of the seabed. He noted that in response to the request by the Special Commission, the secretariat had assembled information on joint ventures in the petroleum, mining and other industries to produce the single model contained in LOS/PCN/SCN.2/WP.18. He pointed out that the model does not contain all the details which are needed for a joint venture arrangement.

35. During the discussions of the model contract contained in LOS/PCN/SCN.2/WP.18, questions were raised as to why the incorporated joint venture model had been selected in preference to the contractual joint venture. It was pointed out that the model contract for an incorporated joint venture could be readily adapted to a contractual joint venture by including the standard provisions which form part of the rules governing incorporated companies in national laws. It was also pointed out that those provisions had not been reproduced for the working paper because they would only have added bulk to the model without adding much to the principles of joint venture arrangements which was the objective of the discussions by the Special Commission.

36. It was noted that most joint ventures dealt with the research and development which goes hand in hand with exploration and the development of human resources. It was pointed out that the provisions of LOS/PCN/SCN.2/WP.18 focussed on the assets of the joint venture without paying particular attention to the issue of intellectual property and the ownership of patents which are involved in the transfer of technology and the joint development of technology. It was noted that in order for the Enterprise to be competitive, provisions must be introduced in the model to take these factors into account.

37. It was agreed by the Special Commission that the joint venture option is the option to be utilized by the Enterprise in its initial operation but that it should be left to the Enterprise to determine the option to select for its operations when it became a fully-fledged operation.

38. The Special Commission's conclusions and recommendations with regard to the model joint venture contract as contained in documents LOS/PCN/SCN.2/WP.18 and its addendum 1 are presented in document LOS/PCN/SCN.2/WP.18/Rev.1 which is reproduced in Annex 3 of this document.

4. Formulation of the recommendation for the initial operation and administration of the Enterprise (Transitional Arrangements)

39. With the recognition that the prospects for seabed mining are presently unfavourable and that there is little likelihood of its coincidence with the entry into force of the Convention, the Special Commission undertook to recommend transitional measures that need to be taken to ensure that there is no hiatus in the evolution of the Enterprise as an institution during this pre-operational period. Its recommendations to the plenary of the Preparatory Commission as regards the purpose of transitional arrangements, functions to be performed under transitional arrangements, the status and structure of the institutional arrangements, and the applicable rules are presented in document LOS/PCN/SCN.2/CRP.5/Rev.1 which is reproduced in Annex 4 of this document.

NOTES

1/ LOS/PCN/L.5 of 11 April 1984, "Statement to the Plenary by the Chairman of Special Commission 2 on the progress of work in that Commission.

2/ LOS/PCN/SCN.2/WP.1 of 27 February 1984, "Special Commission for the Enterprise - Mandate and Programme of Work".

3/ LOS/PCN/SCN.2/WP.2 of 17 July 1984, "The Enterprise - Start-up requirements and preparatory measures." This document, in particular, set forth the full range of considerations.

4/ LOS/PCN/27 of 8 September 1983, "Suggestions by the Chairman adopted at the 5th Plenary Meeting of the Commission on 8 September 1983".

5/ LOS/PCN/L.40 of 4 September 1986, "Statement to the Plenary by the Chairman of Special Commission 2 on the progress of work in that Commission."

6/ LOS/PCN/L.40.

7/ LOS/PCN/L.65 of 1 September 1988 and LOS/PCN/L.70 of 22 March 1989. "Statement to the Plenary by the Chairman of Special Commission 2 on the progress of work in that Commission."

8/ LOS/PCN/L.92 of 21 March 1991, para. 33.

9/ LOS/PCN/BUR/R.15.

10/ LOS/PCN/BUR/R.17.

11/ LOS/PCN/L.5 of 11 April 1984, para. 3.

12/ LOS/PCN/L.40.

13/ LOS/PCN/L.65, para. 29.

14/ At the seventh session (1989, Kingston), the Special Commission concluded that considerable progress had been made in understanding the issues involved in dealing more concretely with the question of a nucleus Enterprise. It accepted the idea that the question was best dealt with by means of a transitional arrangement which did not disturb the constitution of the Enterprise or laid down in the Convention, and which was limited to a specified period that might be lengthened or shortened by the Authority depending on the circumstances at that time.

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15/ In its consideration of this operational option for the Enterprise, the Special Commission reviewed a number of documents. These were:

(a) LOS/PCN/SCN.2/L.2/Rev.1 and 2 of 10 August 1984 and 21 August 1985, the revised proposal by the delegation of Austria for a "Joint Enterprise for Exploration, Research and Development in Ocean Mining (JEFERAD)", introduced at the second informal meeting during the second session;

(b) LOS/PCN/SCN.2/WP.3 of 21 August 1984, containing an "Information note on elements of joint ventures" (second session);

(c) LOS/PCN/SCN.2/WP.4 of 27 August 1984, a "Proposal on a joint venture", made by the delegations of Belgium, France, the Federal Republic of Germany, Italy, Japan, the Netherlands and the United Kingdom;

(d) LOS/PCN/SCN.2/WP.5 of 15 October 1984, "Model Joint Venture Agreement for Seabed Mining", submitted by the Federal Republic of Germany;

(e) LOS/PCN/SCN.2/WP.18 of 9 August 1990, "Draft Basic Joint Venture Contract, Explanatory Memorandum"; and

(f) LOS/PCN/SCN.2/WP.18/Add.1 of 10 August 1990, "Draft Basic Joint Venture Contract".

16/ LOS/PCN/L.10, para. 14, of 4 September 1984, entitled "Statement to the Plenary by the Chairman of Special Commission 2 on the progress of work in that Commission".

17/ LOS/PCN/L.20 of 2 April 1985, paras. 12-14.

18/ LOS/PCN/L.40 of 4 September 1986, para. 4.
